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No. 660

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This serial report contains press and radio coverage on the development of and progress in the various theoretical and applied scientific disciplines and technical fields; and the administration, structure, personnel, and research plans of leading East European scientific organizations and institutions, particularly the academies of sciences.

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EAST EUROPE REPORT

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GDR, CSSR COOPERATE IN PRODUCING MEDICAL EQUIPMENT

East Berlin DER MORGEN in German 4 Oct 79 p 5

[Article by Vera Viskova, Prague: "Slow Motion for X-ray Pictures; GDR and CSSR Cooperate on Medical Equipment; Successful Joint Entry Into the World Market"]

[Text] There are few areas of life in which technology is so exclusively in the service of mankind as medicine. The assortment of products includes today about 8,000 different pieces of equipment, ranging from simple cannula and syringes to complicated operating techniques.

Naturally no single country can manufacture all these instruments, equipment and apparatus itself and still keep up with the most recent worldwide developments. This is why the CEMA nations are developing broad international cooperation in this area which includes specialization and cooperation between the GDR and the CSSR.

In 1971 the two countries signed an agreement on specialization and cooperation in X-ray technology and medical electronics. This contract and other agreements made it possible for the partner nations to limit the assortment of equipment and to increase production and improve quality on this basis.

Questions of specialization and mutual deliveries of equipment were clarified at regular meetings by a permanent working group. The experts of both nations coordinated their plans for procurement of new equipment and instruments. Furthermore, technicians from the GDR and the CSSR are working jointly on the development of new products.

The CSSR for instance, is the sole manufacturer of X-ray image amplifiers in the CEMA nations. But specialists from the GDR assisted in developing the equipment. The GDR was also a large purchaser of this equipment. Another example: In the CSSR the development of the slow motion RK-12 camera for X-ray studies has been concluded. Technicians from the GDR created the developing and X-ray image viewing mechanism for this camera.

Some 90 percent of CSSR medical equipment is manufactured in the Chirana Combine. More than half its production is exported to more than 60 nations. X-ray equipment, dental units, syringes, medical electronics equipment in

particular, and investment facilities like completely assembled hospitals, policlinics, health centers and mobile medical facilties have a good reputation on the world market. Chirana imports products from the GDR under a specialization contract for the X-ray equipment and for outfitting the hospital facilities.

In the present five-year plan the importation of medical equipment from the GDR for domestic consumption and delivery to third markets will have a value of about R20 million. The CSSR exports medical equipment constructed jointly with the GDR to other CEMA nations and to several developing countries. At present, the markets in Latin America are being emphasized.

Complete hospitals supplied in part with equipment from the GDR are being exported by Chirana to more than 30 countries, including: Ethiopia, Mali, Ghana, Egypt, Tunesia, Algeria, Syria, Zambia and Bolivia. On the other hand, the GDR uses medical instruments and equipment for export which were built in Czechoslovakia under these specialization agreements. These are primarily X-ray image amplifiers, dental X-ray equipment and products of medical electronics. During this five-year plan these deliveries to the GDR will have a value of about R30 million.

9280
CSO: 2302

BRIEFS

INTERKOSMOS-20 TELEMETRY CAPABILITY--The "Interkosmos-20" satellite is capable of relaying data to earth. This data may be received by various countries, if these countries possess receivers for the telemetry system, i.e., this data may be received by Bulgaria, Hungary, GDR, Cuba, USSR and Romania. [Excerpt] [Gdansk GLOS WYBRZEZA in Polish 3 Dec 79 p 5]

CSO: 2602

DEVELOPMENT OF DATA RECORDING EQUIPMENT

Budapest SZAMITASTECHNIKA in Hungarian Nov 79 p 10

[Article by Tyihomir A. Topalov: "Development of Data Recording Equipment in Bulgaria"]

[Text] The circumstance that Bulgaria specialized in the manufacture of magnetic data carrying background storage equipment contributed to a significant degree to the fact that it succeeded in solving a number of problems connected with the design and manufacture of data preparation equipment which operates with magnetic data carriers also.

The data carriers of data preparation equipment of Bulgarian development and manufacture are 12.7 mm wide magnetic tapes with a writing density of 32 bits per mm and 8 inch floppy disks. The selection of the tape was justified by the fact that 12.7 mm magnetic tape is one of the carriers which has been used the longest, its capacity and quality are suitable and it is manufactured in socialist countries too. There are no problems in regard to compatibility; this size of tape is used for computers working in our countries. The floppy disk is a compact, reliable, random access data carrier which has a very big future in mini and microcomputer systems.

In the course of creating the data preparation equipment care had to be taken that the newly developed equipment working with magnetic carriers remain close to the preceding data preparation equipment--in regard to the system and on the basis of the chief parameters. In the contrary case use of the equipment would be difficult or simply impossible because it could not be adapted to the already developed process of data processing.

The ES-9002 magnetic tape data preparation unit was the first such device developed in Bulgaria. Comparing it to punch card and punch tape data recorders two chief motifs characterize its advantages: the buffer and the magnetic tape. Data recording and checking and the display of the information character by character are noiseless, selection of the desired operational mode or function is very simple and this greatly increases the efficiency of the work of the operator. The decrease in costs connected with operating the equipment comes from the high degree of reliability. The increase in

amortization time, the savings in time and assets turned to data recording and checking, the simplicity of file formation and the repeated use of the data carrier mean that use of the ES-9002 will result in better economy indexes.

In addition to the basic machine we have thus far developed the following modified versions: The ES-9002.01 with a transcription capability and the ES-9002.02 unit for writing out information stored on magnetic tape. The basic machine has been manufactured in large series for years and is used successfully in several countries.

The ES-9004 magnetic tape data recording equipment is a greatly modernized version of the ES-9002 the purpose of which was a substantial improvement of functional, design and operational characteristics.

The ES-9004 displays the data in blocks. The construction of the product ensures great flexibility in regard to character set and writing density; there is no obstacle to preparing modified versions with writing densities of 8 bits per mm or 22 bits per mm.

If the user desires one can build into the equipment as options a "number 10 module total" and a "number 11 module total" or a "total field" control number.

LSI integrated circuits, outstanding quality connections and a better tape drive mechanism are built into the ES-9004 as a result of which the "error free operation time" has been substantially improved.

The ES-9004 is equipped with a moveable keyboard and its dimensions are smaller. Various types of input/output equipment can be connected to the unit and this significantly expands its sphere of use. The peripherals can be: ES-7187 printer (ES-9004.02), IZOT 6001 card reader (ES-9004.03), a telephone data transmission modem (ES-9004.04), a punch tape reader (ES-9004.05), a punch tape puncher (ES-9004.06) and floppy disk storage (ES-9004.07).

Table No 1 shows comparable data for the ES-9002 and ES-9004 products and the MDS Data Recorded 6401 equipment which uses a similar system and is widely used in capitalist countries.

Table No 1

Parameter	MDS 6401	ES-9002	ES-9004
Buffer memory	ferrite	integrated circuit	integrated circuit
Display mode	by bit	by character	by character
Tape tension method	binding ring	single ring	single ring
Writing method	NRZ1	NRZ1	NRZ1
Writing density	32 bit/mm	32 bit/mm	8, 22, 32 bit/mm
Operating temperature	10-38 C°	5-40 C°	5-40 C°

Weight	122 kg	64 kg	48 kg
Dimensions	749x743x 1092 mm	582x641x583 mm	
Reliability		10^7 bits	10^8 bits
Error free operation		500 hours	1,000 hours
Operational modes	data recording, checking and retrieval; program input and control; input, checking and readout from buffer		

Data preparation systems using floppy disk storage have been developed and manufactured in Bulgaria in recent years. Joint testing of the SM-6901 floppy disk data preparer were successfully completed in April of this year. Null series manufacture of the ES-9112.01 code number floppy disk data preparer and of the ES-9112 "floppy disk--magnetic tape converter" will be completed by the end of the year.

All of the equipment belonging here has been developed on the basis of the SM-600 microprocessor system. They have modular structure and a uniform design.

Table No 2 shows the chief parameters of the product.

Table No 2

Number of programs	10
Reliability	10^7 bits
Average time between two breakdowns	500 hours
Weight	133 kg
Functions	input, processing and checking; retrieval by address; retrieval according to end of data; initialization; totalling; control number generation; copying of disks, file and defined blocks; program chaining; operator work statistics

The parts of the ES-9113 unit are:

--a stand holding the keyboard, an electronics block and a power unit;

--a cabinet containing two ES-5074 disk units;

--a cabinet containing an IZOT 5003 magnetic tape;

--a monitor.

It should be noted that operator performance is expected to increase significantly with this equipment, as compared to the ES-9002 and the ES-9004, on the basis of use of microprogrammed control and random access external storage.

The ES-9003 multi-console magnetic tape data preparation system serves to solve complex tasks connected with data recording and the preparation of input files to be read into the computer. The use of a universal microprocessor guarantees a high degree of intelligence for the system.

The ES-9003 system is built on the following devices:

--An IZOT 310 (first and second module) memory consisting of 32 K 12 bit bit words;

--an SM-5400/001 disk unit with a capacity of 6 Mbytes and a speed of 1,500 revolutions per minute;

--an IZOT 5003 magnetic tape unit with a speed of 32 cm per second, a writing density of 32 bits per mm and an NRZI writing method;

--an IZOT 0232 operator console;

--a DZM 180 mosaic printer with a printing speed of 180 characters per second and with 132 positions per line;

--an ES-0101 16 character keyboard;

--VKP 171 videomonitors with 128 position screen (4 lines/32 positions).

It must be emphasized that because of the very high price of its common parts a system operating with fewer than 8-10 consoles is not competitive with independent buffers.

Research done in Bulgaria proves that use of this equipment for data preparation increases operator performance by 40-120 percent as compared to punch card and punch tape data recording. In addition it significantly decreases the cost of data preparation, which is presently about 30-50 percent of the total cost of machine processing.

Although on-line processing has the greatest future the batch data preparation method will dominate for a good time still.

8984
CSO: 2502

ES-1035 SYSTEM WITH SPECIAL MATRIX PROCESSOR

Budapest SZAMITASTECHNIKA in Hungarian Nov 79 p 7

[Article by G. P. Nikolov, V. D. Lazarov, G. P. Dashkalov, J. V. Ivanova and K. D. Kirov: "The ES-1035 System With Special Matrix Processor"]

[Text] Ever increasing use is being made these days of computer technology tools for the swift and efficient digital processing of large volumes of data in matrix or vector form. In general processing of this type is needed in the following areas:

--Seismic research (geophysics, the discovery of oil, gas and useful minerals);

--Fluid mechanics research (meteorology, oceanography, aerodynamics);

--Amplifying and processing graphic information (radar, photo processing, etc.);

--Cosmic research (telemetry, trajectory guidance);

--Nuclear physics research;

--Matrix algebra;

--Mathematical statistics;

--Solution of differential equations;

--Digital signal processing, etc.

At the same time modern universal computers--irregardless of the constant increase in operating speed--are not capable of satisfying the performance and capacity needs of the types of processing mentioned. The many times repeated arithmetic operations needed in the case of such large volumes of data cannot be realized in practice. So it is necessary and economical to create special computer technology tools to solve the problem.

The development of efficient matrix calculations can be approached in several ways. We selected one of these, in our opinion the most favorable in the present developmental phase of the ESZR [Uniform Computer Technology System], the ES-2335 matrix processor, which we exhibited at the 1979 ESZR-MSZR [Uniform Computer Technology System-Minicomputer System] show.

Let us take a look at a few of the most essential characterisitcs of the ES-2335.

Purpose

The ES-2335 matrix processor is a model-dependent, special peripheral processor designed to perform high-speed matrix conversion in an ES-1035 computer system. The data processing performed by it takes place independent of time and in parallel with operations taking place in the ES-2635 processor.

Connections

The ES-2335 matrix processor is connected to the ES-2635 processor by means of an adapter built into the central unit which can take the place of some selector channel thereof. A special I/O interface provides a connection between the adapter and the ES-2335.

Control From the System Side

From the side of the system the matrix processor and its adapter can be regarded as a combined I/O device which unites the functions of a channel, control unit and external device. Control of the complex takes place with the same control word system which is used in the I/O system of the ESZR, using the I/O switching mechanism.

Data Format

Data which is to be processed in the matrix processor can be prepared in any of the following three formats used in the ESZR:

--fixed decimal, direct code, short format;

--fixed decimal, supplementary code, short format;

--floating decimal, short format.

Instruction System

The operations can be broken down into the following groups:

Vector movement--the data go from one field of operational memory to another, with a change in format (fixed decimal to floating decimal or vice versa) if required.

Matrix algebra operations:

--scalar multiplication

--vector product by element;

--vector sum by element;

--sum of vector elements;

--partial matrix conversion (multiplication);

--sum of squares of elements;

--signed matrix square.

Matrix comparison (determining the minimum or maximum element and their position).

Complex multiplication.

Solution of differential equations.

Signal processing operations:

--inverse addition,

--inverse multiplication,

--solving into a Fourier series.

Squares interpolation.

Components of the Matrix Processor, Elements and Blocks

--A telecommunications and operand selector sub-processor provides a connection with the adapter and the ES-2635 processor, the address arithmetic for operands and control instructions and operand selection;

--An arithmetic sub-processor carries out closed algorithm arithmetic processing of floating decimal numbers;

--Buffer storage stores operatnds, intermediate and final results and buffers the data flow of the interface and the arithmetic sub-processor;

--The control memory stores the micro-program controlling the two sub-processors;

--A micro-programmed control block.

Basic Parameters

--Machine cycle time: 200 nanoseconds;

--Performance capacity: $5 \cdot 10^6$ operations per second (multiplication and addition);

--Transfer rate of interface between matrix processor and adapter: 3.5 Mbytes per second;

--Transfer rate of arithmetic sub-processor: 20 Mbytes per second;

--Buffer capacity: 2 x 32 words;

--Control memory capactiy: 2 K words (96 bit);

--Maximum size of operand: 64 K elements;

--Element base: TTL--1, 2, 3;

--Construction: two frame rack;

--Power used: 1 kW.

Program Supply

The basic software of the ES-2335 matrix processor consists of an access mode and a resident module. It is written in an assembler language, making use of the possibilities of the macro language and the hypothetical assembler operator.

The access mode is activated by the user program in the FORTRAN, Assembler or PL/1 languages or with the aid of a fixed format Call Operator.

The access mode contains the following phases:

--control phase;

--syntactic analysis;

-channel program control;

--a sequential dispatcher for service query;

--message transmission;

--switching processing.

In addition to the basic software the program supply of the matrix processor also contains a signal processing program system. This is a sub-program

package which is used during the analysis of various digital signals. The package consists of subroutines which synthesize criterionized filters according to the given characteristic and of routines which evaluate the efficiency of the filters.

In the absence of sufficient experience and an accepted method to measure the performance of systems with matrix calculation it is fairly difficult for the time being to determine the efficiency deriving from use of the matrix processor or to select that category of tasks where use of the matrix processor is especially useful.

We have conducted very many experiments in the interest of approximately measuring the increase in system efficiency. In the course of these we ran the same specially selected data processing examples on an ES-1035 computer with and without use of the ES-2335 matrix processor. These experiments confirmed the preliminary calculation that efficiency must be increased by one or two orders of magnitude.

In the course of one such experiment we hypothesized 2,000 quanta as the middle value of a seismic fracture line. We used the matrix processor for certain basic processing (e.g., deconvolution before and after addition, filtering before and after addition, use of fan type filtering on 10 percent of the data.) The difference in central unit machine time used was 65.6 seconds for the entire cycle. It follows that about 4,000 machine hours would be needed for matrix processor processing of 300,000 24-channel pictures per year but without it there would be need for about 134,000 machine hours. So in this concrete case efficiency was increased 34 times.

Photo caption: The Bulgarian ES-2335 matrix processor could be seen at the ESZR-MSZR exhibit in Moscow too.

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MICROPROCESSOR SYSTEMS IN BULGARIA

Budapest SZAMITASTECHNIKA in Hungarian Nov 79 p 11

[Article by S. Khristova and L. Alexandrov: "Microprocessor Systems"]

[Text] Microprocessor systems represent a branch of computer technology which is developing with exceptional speed.

In the opinion of experts the price/performance index of microprocessor systems exceeds that of minicomputers by 4-7 times.

In many cases microcomputers can replace minicomputers, especially in the case of small and slow systems. In addition the microprocessor solution is cheaper by an order of magnitude and is much more reliable.

The development and manufacture of the model 600 microprocessor family and of miniperipherals has created the prerequisites for Bulgaria becoming one of the CEMA states with the potential of producing microcomputer systems.

Several microprocessor systems have been developed on the basis of the model 600 microprocessor family which can be used in the most varied branches of the economy.

The system has the task of functioning as a data collection and preliminary processing tool, at the place where the information arises, for large information systems. It is also possible to use the IZOT-0250 in warehouses of small and medium size enterprises and in agriculture. The IZOT-0250 can be used to process marketing information for finished products, for labor, planning and wage calculations and record keeping, for materials records, etc. In the course and wage calculations and record keeping, for materials records, etc. In the course of processing documents the information introduced or produced goes onto floppy disks. These disks must be sent to computer centers where large computers or minicomputers process the recorded data.

The IZOT-0250 has the following configuration:

--central control equipment (using a microprocessor with 12 Kbytes of operational storage to store data and programs);

--an alphanumeric, numeric and functional keyboard;

--a display: numeric and functional;

--an ES-7187 printer;

--two ES-5074 floppy disk units.

The chief operational modes of the IZOT-0250 are:

--use of the alphanumeric keyboard for input to operational memory of a program written in a problem-oriented input language, and translation of it into machine language;

--checking of the program put in through solution of examples given;

--transfer of the program read in to disk to ensure repeated execution;

--transfer of constant data to operational memory and recording of these on diskette;

--running the program written on disk, as a result of which the necessary basic or summary documents are prepared.

As a result of using a problem-oriented language for programming, the multiple operational modes, easy and convenient operation and the high degree of reliability the IZOT-0250 can be used as a very efficient tool to process economic information.

Planning and control systems for industrial enterprises have been developed on the basis of the IZOT-0250. These include a user program package prepared for industrial enterprises which incorporates record keeping for the movement of finished products and sales by customer in quantity and value. It prepares summary documents in connection with financial-accounting activity including the correct listing of assets and liabilities according to various accounting columns. It provided mechanized compilation of technological documentation and automatic production of cards containing work and material expenditure norms too. It prepares limit cards issued for manufacture and automatically checks adherence to the given limits. Sypervision of production plan fulfillment and preparation of daily, 10-day, monthly and quarterly reports are elements of the APCS [user program package].

Another application is the system developed for agricultural planning and guidance. This includes plan preparation and control elements and the production of summary information reflecting the results of economic work. The APCS covers the entire accounting system including materials accounts, calculation of amortization writeoffs, book keeping according to account

columns and financial calculations. It keeps a record of products produced and sold, keeps account of and prepares plans for machines and does wage accounting.

The IZOT-1002C Word Processor

Word processing is a relatively new area for microprocessor applications which has primarily a future use.

The word processor serves to prepare, edit and duplicate various textual documents. In addition to traditional editing work it can serve the following functions:

--erasing part of the text;

--interpolating part of the text;

--exchanging part of the text;

--tabulation;

--editing of headings;

--retrieval of documents;

--combining of documents;

--preparing documents which contain the same parts of text, etc.

Control of information input has been ensured. Information is displayed on a CRT screen in 24 lines with 80 positions each. The form in which the information is displayed can be programmed in advance. The entire text displayed can be followed with a raster controlled by the operator from the keyboard; certain corrections can be made here.

Use of the ES-7187 alphanumeric printer ensures good quality printing and writing in Latin or Cyrillic can be done by exchanging the printer disk.

The machine transfers the information put in to a floppy disk so it can be used repeatedly for duplication or corrections.

The components of the IZOT-1002C are as follows:

--a microprocessor system with operator console;

--two ES-5074 floppy disk units;

--an ES-7187 alphanumeric line printer equipped with a floppy disk;

--a monitor to indicate the information read in.

The ES-9112 Data Preparation Equipment

This equipment serves to prepare floppy disk data at computer centers or enterprises.

If we make a comparison with those traditional functions performed by punch tape, punch card and magnetic tape data preparation equipment then the ES-9112 provides the following possibilities:

--block retrieval by address and retrieval to the end of the data;

--copying;

--interpolation of blocks;

--checking;

--diagnostics;

--initiation;

--program chaining, etc.

Comparing floppy disk data preparation equipment to the methods of recording data used thus far shows the following advantages:

--much broader possibilities are available to the programmer;

--the equipment can be expanded with minimal growth--by one or more work sites;

--operational data preparation.

The components of the ES-9112 are as follows:

--a microprocessor system with operator console;

--two ES-5074 floppy disk units;

--a monitor to indicate the input information.

With the development and swift introduction of such systems we are creating conditions for the automation of administrative guidance work and the simplification of commercial activity and financial accounting. All this will greatly help in the solution of the most important computer technology problems of the economy.

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PROBLEMS IN THE USE OF COMPUTERS

Budapest SZAMITASTECHNIKA in Hungarian Nov 79 p 11

[Article by V. Vatev: "Problems in the Use of Computers"]

[Text] The introduction and effective use of computer technology in production demands a modernization of planning systems.

Before all else a suitable harmony must be created between the delivery of the planned computer technology tools and the preparation of the users. In planning deliveries greater attention must be given to regional locations and this must be realized throughout the entire process of planning.

Efficient Use

Different procedures are needed when planning the use of computer technology. The planning system serves to ensure the full employment of the available capacity and this is only one factor in the efficient use of computers. High efficiency can be achieved only by a planning system built on the following principles:

--undertaking the supplementary tasks for intensive utilization of computer technology capacity and decreasing unproductive time;

--introducing new data processing technologies and new planning and programming methods and tools and decreasing the costs of consumables;

--significant savings in materials and live work; optimal utilization of productive capacity and improving the quality of the product.

Neglecting any element of the plan or a less than complex solution of the problem cannot lead to the desired result.

Regional Tasks

The development of the network of regional information computer centers will continue in the years ahead. The results achieved thus far prove the

advantages to be derived from the concentration of machine capacity and expert staffs. In the past period we have created a significant stock of machines consisting of modern computers and we have trained a large number of planners, programmers and maintenance personnel. In the future we must strengthen the leading role of the regional centers in the following aspects:

--ensuring the cooperation of the automated guidance systems already introduced with the other computer centers;

--spreading new applications among users;

--experimenting with and introducing new data processing technologies, planning and programming methods and tools and new work organization methods;

--ensuring information services to industrial and agricultural units, organizations and administrative organs which do not have their own computers.

All this requires that by the end of 1980 we finish supplying the regional computer centers with large capacity ESZR [Uniform Computer Technology System] type computers and build up the basic units of the regional remote data processing systems.

An accelerated development of the national remote data processing net is a timely and urgent task. A well developed remote data processing network is necessary for high efficiency use of computer technology tools.

The plus to be derived from the development and operation of the net is a function of the reduction of the burden on the available telephone lines and exchanges.

National organization of professional maintenance is an important task too.

Service and Maintenance

The present forms of providing service were developed in 1972-1973 and they reflect the condition of computer technology characteristic of this period. They are no longer suitable for satisfying the needs of the users. At present two specialized services operate in the country--Izotimpex and the service enterprise belonging to the ESZR Committee. These have the task of taking care of the regional computer systems, beyond the guarantee, and of providing service, under the guarantee and beyond the guarantee, for computers and minicomputers of domestic manufacture. Service has also been provided for the computers manufactured by IBM. But maintenance of some hardware items falls on the user. This is especially unfavorable in the case of computers and minicomputers working in production control.

A problem awaiting solution is the perfection of forms used to provide maintenance service to subscribers. The form of semi-subscriber maintenance

is used only in exceptional cases because of the limited responsibility assumed by the service center. The centers do not use the form of "high level help" because the subscription fee is low and so there is no economic incentive. At present the most successful form is full subscriber maintenance but it is effective only in those areas where there is a service organization.

The following must be done to create efficient service and to modernize the existing organizational forms:

--create a uniform service network independent of the type of computer and independent of the distance between the user and the service;

--the realization of flexibility which will guarantee service to a given computer system or product from the very first delivery, making possible the maximal satisfaction of user needs independent of the peculiarities of the concrete application;

--creating common interest for the user and the service organization to encourage full utilization of maintenance personnel and reliable operation of the computer system.

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INTEGRATED CIRCUITS, MICROPROCESSORS LISTED, USES DISCUSSED

Prague HOSPODARSKE NOVINY in Czech No 45, 1979 pp 8-9

[Article by Prof Engr Milan Kubat, Dr of Sciences, Deputy Minister for Technical and Investment Development of the CSSR: "What Does Our Microelectronics Need?"]

[Text] In 1948 the transistor, in 1956 the thyristor, in 1959 the integrated circuit, in 1979 the microprocessor: these new developments in solid-state electronics, following each other in rapid succession (which were proceeded in vacuum tubes by the triode, pentode, thyrotron and module, but enough of this), instantly became solidly established in electronic theory and practice. Moreover they pervaded the entire production activity, and then even the nonproduction activity of man, i.e. hi-fi, stereo and quadrophonic sound in the cultural area. Microelectronics has become a new branch of electronics. People speak of the "third industrial revolution": the first was the steam engine and transmission, the second the individual electric motor, and the third microelectronics.

Just as everywhere else in the world, our central organs are devoting great attention to the development of electronics and microelectronics and to the electronicization of the national economy. A number of CSSR party and government decrees and directives could be cited. Most recently, on 27 September 1979 the CSSR government instructed the federal ministry of technical and investment development, in cooperation with all other sectors and departments, to develop a program for electronicization of the national economy. Intense work on this program is now under way.

The Revolutionary Character of Microelectronics

In the second half of the twentieth century, information has become a new category, and ultimately a commodity as well. It is offered for sale, bought, sold, concealed, extorted, reconnoitered, and made the object of embargo ercion and blackmail. It is acquired, transmitted, processed, stored and reproduced by electronics, particularly microelectronics.

The latter is developing at an extraordinarily rapid pace: the innovation cycle at the stare of the art takes three to five years here. Microelectronics is a decisive vehicle of technical progress and a critical factor in the "scientific and technical revolution." In this respect it differs from all other areas of industry. Although it is by and large merely an "assembly" sector and less frequently functions as a final product, nonetheless it pervades all areas of human activity. It determines the technical, functional and also economic level of most modern industrial products, even for small consumers. Thus it affects the condition of extensive strata of the populace.

Electronics and microelectronics impinge to an important degree on the social and economic processes of society. They eliminate a number of old occupations as they create a new one; they are leading to a shortening of the working day, to expanded free time, and are affecting labor productivity and the utilization of free time. The leadership organs of all countries are concerned with their incorporation and their implications.

They have an immense effect on conservation of energy and materials, both directly (light weight, small dimensions, small consumption) and indirectly by increasing value per kilogram and the utility value of all products and equipment, and by optimizing their design, production and operation.

Microelectronics (components, knowhow, process equipment for microelectronics workplaces, certain special materials, devices based on it, nonmaterial services for its use and software) has become a strategic area. Its accessibility is frequently a tool of economic and political pressure. It is of particular importance for defense.

Even the most skilled craftsmen among the prople cannot create microelectronic structures with ordinary tools. Microelectronics production is characterized by a close connection with science: with mathematics, physics, chemistry, metallography and other scientific disciplines. At the same time, skilled craftsmen of various types are needed, particularly for the production of special industrial equipment: precision mechanics, optics and electronics.

Microelectronics has become one of the important measures of the maturity and technical-economic level of developed industrial countries. Even though the ultimate assembly of certain electronic subassemblies and final products (such as watches and calculators) is frequently entrusted to developing countries, the decisive matter is the development and production of highly demanding integrated circuits and magentic, electrooptical and other components, and the development of production equipment and software. These are the domain of advanced research and industrial departments in the most advanced industrial countries of the world, and absorb immense financial and other resources.

What We Must Do

We have extremely limited resources of raw materials and energy. A ton of standard fuel cost about 9 dollars on the world market in 1970 in the form of petroleum, while now it costs about 117 dollars (with oil at 170 dollars per ton). Meanwhile, electronically controlled converters and industrial drive units using thyristors are saving 200,000 tons of standard fuel a year during the Seventh Five-Year Plan. The consistent use of electronics in the entire national economy could make it possible to save at least 10-15 percent on electrical energy. In 1990 this could amount to over 6 million tons of standard fuel a year.

In addition, electronics makes possible great savings on materials. Let us present an illustratve example from the Czechoslovak machine-building industry:

--An electronically controlled small-size knitting machine has, for the same cost, half the weight and twice the output of the same type of machine when mechanically controlled.

--The model 3600 Czechoslovak-produced rolling mill train, sold to the USSR without electronic control, costs 118 million rubles. A newer similar train with electronic control costs 275 million rubles with almost the same weight of installed equipment. The price per kilogram of the installation has increased by a factor of 2.5 through the use of electronic control.

The current price-per-pilogram levels of different machine-building products vary widely. They range from a minimum of 30 korunas per kilogram (motor vehicles and tractors) to 1,500 korunas per kilogram for computer equipment and as much as 30,000 korunas per kilogram for integrated circuits.

However, the breakdown of machine-building products cannot be chosen at will. It depends primarily on what the purchasers and consumers order from the industry. Our experience indicates that high-quality electronics products (such as computer peripherals and integrated circuits) can be used with advantage for the consumer in all areas producing for export.

In addition, designers and users of machine-building products are making increasingly great demands for electronics. Modern machine tools, forming tools and textile machinery are already unthinkable without electronics, and the trend is rapidly including other areas (compressors, motor vehicles, agricultural and food processing equipment, building equipment and even consumer goods).

Without electronics, many products will soon be unsaleable.

Basic Points and Solutions

The documents of the 15th KSC Congress and sessions of the KSC Central Committee and the CSSR government contain a number of conclusions regarding the development of electronics and microelectronics, mandating preferential development of these areas. We could cite some results that rank as quite positive; however, party and state direactives are not yet being fulfilled to the requisite extent.

Among the good results we may include in particular mastery of the production of analog integrated circuits by the TESLA Roznov national enterprise; these are designed primarily for television and radio engineering and for measuring applications. Included are the integrated circuits of low-frequency output amplifiers (5W, 20W), high-frequency amplifiers, operational amplifiers, voltage regulator circuits, demodulators and circuits for controlling brightness, contrast and color, as well as consumer electronics. The most important types of such circuits are shown in Table 1. Most of these analog integrated circuits as well as certain types of digital integrated circuits are being exported in large quantities to socialist and developed nonsocialist countries.

Also meriting an extremely positive evaluation are certain results in investment electronics. They include radio and television amplifiers, radar sets, telecommunications equipment (particularly telephone exchanges), electronic measuring and laboratory instruments (particularly electron microscopes, polarographs, chromatographs and the like) and a number of computer peripherals. We are also exporting all of these devices to demanding world markets in considerable quantities.

However, we have been considerably less successful in those areas of microelectronics which take in large-scale integration (LSI) digital integrated circuits, as well as in demanding types of hybrid integrated circuits and in production machinery for microelectronics. We also have rather poor results regarding the sophistication and reliability of certain other electronic components and devices.

After analysis of the situation, central and enterprise organs, particularly the federal ministry of general machine building, the federal ministry of technical and investment development and the board of directors of TESLA VHJ [economic production unit] have taken a series of energetic steps during the last two years to speed up the development of microelectronics. The greatest attention is being devoted to the accelerated development of LSI digital circuits (with up to 20,000 components per chip) of unipolar and bipolar types, as well as development of hybrid integrater circuits (up to 300 components per chip). Solid progress has also been made in the development of special-design production equipment without which no further progress could be made in the production of LSI circuits.

In addition to progress in accelerating the development of domestic microelectronics, agreements on international scientific and technical cooperation have been concluded as well. The most important of them is the interstate agreement concluded between the CSSR and the USSR in 1979. Cooperation with the GDR has also been deepened, and new agreements are to be concluded in this area. Efforts to deepen scientific and technical cooperation with other countries are under way. Licensing possibilities have also been used, although to a limited degree.

These measures are also expected to result by 1980 or 1981 in the beginning of production of all basic types of integrated circuits required for microprocessor control equipment in all sectors of the national economy.

In addition to digital integrated circuits and microprocessors, the development of single-board computers (SBC's: a single circuit board with 60 or 80 integrated circuits) and relevant software will be pursued.

Program development and generation equipment is also planned in so that customers can produce user programs; they can buy these and use them to develop their own software. The equipment consists of a controlling desk-top computer with the requisite semiconductor internal storage, a display and keyboard, floppy-disk external memory, a programmer to "burn in" programs in programmable ROM circuits, and in some cases a desk-top printer (teletypewriter) and tape reader and punch. The apparatus makes possible programming and diagnosis of single-board computers and systems incorporating them. Steps are being taken to make single-board computers and their software available by 1980 or 1981.

Electronicization of All Sectors

These measures can provide only the basic selection of technical facilities and no more. Accordingly it is important that all sectors immediately organize work on the employment, assimilation and mastery of microelectronics and microprocessor control, which cannot be provided ready-made from above or outside. But this activity has already been begun in some areas, parculatly in cutting and shaping machine tools, and to some extent in textile machine building. Almost no beginning at all has been made in the remaining sectors and branches, but it is undeniable that electronicization is being employed almost everywhere. The worldwide trend is already clearly visible. A number of developing applications of electronics can be cited for illustrative purposes, wihtout any claim to completeness:

--automation of manufacturing and assembly operations, and construction of integrated production sections, particularly by installation of numerically controlled machine tools and machining centers controlled by minicomputers or microcomputers;

--in the textile machine building industry, electronic control is leading to a fundamental upgrading of the productivity of knitting and weaving machines, including indication and elimination of defects, as well as automated preparation of new patterns and the introduction of variability into printing;

Table 1. Analog Integrated Circuits from TESLA Comparable With World Levels

Low-Frequency Amplifiers	
MBA 810A	5W low-frequency power amplifier for radio and television receivers, phonographs and tape recorders
MDA 2010	12W low-frequency power amplifier
MDA 2020	20W low-frequency power amplifier
High-frequency Amplifiers	
MA 3000	compensated differential high-frequency amplifier for frequencies up to 30 MHz
MA 3006 and MA 3006	high-frequency amplifier for frequencies up to 120 MHz
Operational Amplifiers	
MAA 501, 502, 503, 504 series	operational amplifier with high voltage gain (up to 70,000 with open loop
MAA 741, MAA 741C, MAA 748, MAA 748C series	operational amplifier with high voltage gain (up 70 150,000 with open loop) and wide range of feed voltages (2-33 V)
MAA 725, 725B, 725C, 725H, 725J, 725K series	operational amplifier for precision low-noise low-frequency and ss [expansion unknown] amplifiers
LF 156 equivalent	operational amplifier with FET input transistors
Regulators	
MAA 723, MAA 723H	precision voltage regulator: 2-37V, 150 mA
Circuits for Radio and Television Receivers	
MAA 66T	high-frequency amplifier, limiter and coincidence detector, and low-frequency preamplifier for FM

MCA 640	color signal amplifier and circuit for production of synchronization (PAL) and indentification (SECAM) signals
MCA 650	color signal demodulator
MCA 660	brightness, contrast and color saturation controller
MBA 530	RGB matrix for color television
MDA 1044, F	vertical scan for television set

--in the automotive industry, control units are being prepared for economical fuel feed, running preignition control, electronic ignition, and antiskid braking force regulators, as well as sensors for a wide variety of information and for monitoring of control activity, dashboard digital displays for these, and built-in receivers giving direct official reports on the transport situation;

--automation of graphics, reprographics and optomechanical instruments and of pumping technology is leading in particular to acceleration of these processes and their simplification;

--in agricultural machinery, in addition to radio communications, electronics is making it possible to improve fundamentally the quality of crop and livestock production technology: through proper composition and amounts of feeds, automatic milking with indication of the animal being milked, diagnosis of disease and the like; in crop production, the automation of plowing and harvesting by means of remote-controlled equipment, handling of produce, classification, control of driers and grading of produce according to ripeness;

--in construction, control and measuring equipment in the production of building materials and in dispatcher work;

--in health care, it will assist in systematization of preventive prognostics and diagnostic and treatment work; without electronics and microelectronics, intensive care units would be impossible, as would a number of other demanding medical facilities;

--in education, the demands on the teaching process stem from the increasing quantity of basic information; basic improvement of the training process is made possible by the application of electronics (language laboratories, calculators, cybernetic systems, systems for checking student knowledge, electronics in pedagogical technique;

--consumer electronics will be aimed at mass information transfer, improving culture, making housework easier and the like.

It is clear that electronicization of these and other sectors and areas will, under Czechoslovak conditions, require the organization of extensive proparatory work, primarily by the departments and areas themselves. Each sector must begin without delay to train qualified personnel for this work (electronics and systems engineers) and must organize problem-solving teams to start this work not only in the development, design and planning sectors, but also in the shop area (prototype and semiconductor production shops).

In general the required capacities will not be large. No one will get them as a "gift from above." They must be built from below using resources which the economic production units and enterprises already have. The main requirement will be to change the incentive climate and to retrain personnel. Electronics is by no means an extraneous addition; in most cases it replaces and extends the functions of earlier mechanical elements and assemblies which provided less perfect and less flexible machine control. For example, the older universal lathe had about forty gears, while today it has four and is driven semiautomatically by electronic and sometimes microprocessor control.

The electronics industry must provide universal components and assemblies (integrated circuits, microprocessors). The design of systems and single-purpose assemblies (such as electronic breakage indication on textile machines and the like) will generally have to be developed and produced by the future users themselves. Only in exceptional cases will such units be provided by the electronics industry.

Thus microelectronics requires primarily a firm basis in the training, knowledge and initiative of workers in the enterprises which have the possibility of utilizing the advantages of electronic equipment to improve the utility value of their products. Primarily, there must be an ability to work with microprocessors.

Prospects and the Activities of Central Organs

Clearly the future will also require that management work at the central level be further improved and deepened so as to speed up the development of microprocessors and achieve rapid return on resources invested.

This poses primarily the following requirements:

--the key of all electronics is the microelectronics components base, and expanded production of modern integrated circuits, especially digital ones; assuring this must be given the highest priority;

--every new undertaking, including microelectronics, requires a certain advance investment; a bold approach must be taken to capital investment so as to keep preparatory work from dragging on over a number of years;

--a fast, high return must be required; this applies to investments, foreign exchange, support for license production and the like;

--a vital question in the successful development and production of microelectronics components is special-design production machinery; this includes various types of special photographic equipment for reproducing layouts, furnaces and accessories, equipment for epitaxial and ionic deposition and the application of contacts, packaging equipment, measuring and monitoring apparatus and the like. A suitable machine capacity must be concentrated in this area, and the watchmaking and optical industries and the capacities of large machine-building research institutes and prototypes utilized. In short, concentrated assistance to microelectronics from the precision machine-building industry must be organized. This approach has been taken in a number of other socialist countries, resulting in considerable progress.

--here too, we cannot master everything ourselves. Particularly in the areas of components, processes, process equipment and special materials we must organize effective division of labor and cooperation with the other socialist countries, but also with the nonsocialist world. Moreover, our electronics is not very active in foreign trade, even though there are no objective reasons for this situation. We must develop a number of saleable technical conceptions to expand international exchange.

--all sectorial central organs will need to develop, on the basis of the unified state program prepared by FMTIR [federal ministry of telegraph and radio], their own concentions of electronicization. It will not be superfluous to analyze the capacities for utilization of electronics, training of personnel, structural changes, and product or production innovations using electronics and microelectronics.

Electronicization and microelectronics are not the hobby-horse or brainchild of certain "initiated" individuals. They are the result of an objective tendency of worldwide development and a vital necessity for the entire national economy. This vital necessity includes at least a working familiarity with electronic terminology. The notions of "bit," "byte," "MOS," "planar," "epitaxial" and a number of others cannot be considered to be just the domain of the "initiated." Similarly such concepts as "transistor," thyristor" amd "triac" have already become common and irreplaceable, and in like manner every technician, even the so-called "pure engineer," as well as the management worker (at least in machine building) with an economic orientation, must have a familiarity with at least the basic terminology of this rapidly developing field. Today this is part of a general education.

The greatest help in gaining an overview of a field with which few can avoid coming into contact comes from the courses offered from the Czechosloval Scientific and Technical Society's Houses of Technology, which have previously been undervalued. It appears that without this valuable activity it would not be possible to make progress in introducing, i.e. "selling," machine-building products incorporating electronics which increase their utility value, price per kilogram and competitiveness.

Table 2. The 8080 Microprocessor System (Unipolar)

Unipolar Circuits	
8080A	central processor (CPU)
MHB 1012	universal asynchronous receiver-transmitter (UART)
MH 8251	universal synchronous, asynchronous receiver-transmitter (USART)
MH 8255	programmable I/O (PPI)
Bipolar Circuits	
MH 8224	clock frequency source for 8080A CPU
MH 8228	bus control circuit and driver for 8080A CPU
Unipolar Memory	
MHB 1902	1 Kbyte CMOS RAM
MHB 2102	1 Kbyte NMOS RAM
MHB 9702	1028 x 8 Kbyte EPROM
Undesignated type	16 Kbyte NMOS dynamic RAM
Circuits for Unipolar 8080 System, Specialized for GDR	
U 855 PIO	parallel I/O circuit
U 857 SIO	serial I/O circuit
U 857 CIC	clock circuit (pulse generator)
U 858 DMA	direct memory access circuit
U 253 D	1 Kbyte dynamic RAM

Table 3. 3000 Microprocessor System (Bipolar)

MH 3001	control unit
MH 3002	arithmetic-logic unit
MH 3003	fast transfer circuit
MH 3205	1-of-8 decoder
MH 8205	1-of-8 decoder
MH 3212	8-bit I/O circuit
MH 8212	8-bit I/O circuit
MH 3214	priority interrupt circuit
MH 8214	priority interrupt circuit
MH 3216	4-bit bus driver (noninverting)
MH 3226	4-bit bus driver (inverting)
MH 74188	256-byte (32 x 8) PROM
MH 74S 287	1024-byte (256 x 4) PROM
MH 24S 71	2048-byte (512 x 4) PROM
MH 74S, 201, E	RAM, 256 x 1 byte
MH 93425	RAM, 1024 x 1 byte
MH 82S11	RAM, 1024 x 1 byte
MH 75 S 97	RAM, 1024 x 1 byte

Microprocessor Systems and CMOS Circuits

In the first stage (until 1981), two microprocessor equipment systems will be introduced in the CSSR: the 8080 and the 3000. Both are closely connected and supplement each other in microprocessor applications with certain types of integrated circuits, so that they cannot be considered separate systems.

The 8080 system is functionally slightly slower: the microprocessor frequency is 2 MHz. It is developed on the basis of unipolar MOS technoolgy with an N channel (silicon gate) and includes 13 basic types of integrated circuit, as shown in Table 2. These integrated circuits (and certain others from the 3000 system) can be used to develop single-board computers (SBC).

The 3000 system is functionally somewhat faster; the microprocessor frequency is 10 MHz. It is based on bipolar technology and includes 13 basic types of integrated circuit, as shown in Table 3. Here the microprocessor is divided into two integrated circuits: the MH 3001 is the control unit and the MH 3002 is the arithmetic-logic unit. Table 2 shows which types will be produced by the TESLA Roznov national enterprise and which will, by agreement, be obtained from the GDR. These agreements with socialist countries are being further refined.

CMOS circuits for communications and consumer electronics: in addition to NMOS technology with a silicon gate, CMOS-type integrated circuits with complementary MOS transistors will be put into production. These are distinguished in particular by their low energy consumption, so that they are suitable for calculators and electronic watches. Their other most important use is in communications equipment for telephone branch offices. According to plan, the production of these circuits will be begin in the TESLA Piestany national enterprise, also by the end of 1981.

It is very difficult to foresee the future in microelectronics, which is developing so fast, many years ahead. However, it is certain that as soon as the 8080 unipolar system, which consists of an 8-bit microprocessor, is mastered, it will be necessary rapidly to introduce 16-bit microprocessor systems and 32-bit microprocessor systems with increased speed and memory capacity and simpler programming. Optoelectronic systems, which have a number of other advantages, particularly greater immunity to disruptive electromagnetic fields and ability to transmit a broader range of frequencies, will be developing in parallel with microelectronics.

9427
CSO: 2402

FINDINGS OF RESEARCH ON RED BLOOD CELLS REPORTED

East Berlin NEUE ZEIT in German 7 Sep 79 p 6

[Unattributed report based on talk with Prof Dr Samuel M. Rapoport, president, Society for Experimental Medicine: "Maturation Process of Red Blood Cells Explained"]

[Text] In coming months both domestic and foreign specialists will be able to learn about the status of experimental medical research in the GDR at several conventions and gatherings. Prof Dr Samuel M. Rapoport, president of the Society for Experimental Medicine, announced an expanded working conference for September in Berlin, where information will be presented about the contribution of experimental medicine to research in the areas of diagnosis and therapy, to the development of health care in general, and on interrelationships between medicine and industry.

Numerous young scientists will report on their share of the research at the convention. Professor Rapoport referred to work performed at the Institute for Physiology and Biological Chemistry of the Humboldt University in Berlin under his direction. The young scientists of this institute took part in exploration of the red blood cells (erythrocytes). Professor Rapoport reported that there has been success recently in identifying the most important factors affecting maturation of red blood cells from their precursors. This is an enzyme with previously unknown effects which inhibits cell respiration and destroys cell organelles which disappear during maturation. This development is of fundamental significance for basic research and is of practical use for specific clinical diagnosis of anemia.

In addition, Professor Rapoport and his colleagues have developed a mathematic model of the energy consumption of red blood cells based on experimental evidence. In connection with this, other important processes for blood conservation and treatment of blood diseases can now be explained.

In our talk the internationally recognized scientist stressed that several theoretical areas of medicine have received significant propelling impetus in recent years. Among these are biochemistry, pharmacology and biomedical technology, but also anatomy, pathology and physiology. These and other

areas contribute significantly to the fact that in clinical practice studies can be implemented accurately, quickly and extensively, that suitable technical equipment is made available and that patients can be treated in accordance with the most recent knowledge. For instance, anatomists or pathologists are no longer occupied exclusively with the dead body, but they are developing methods for tissue sampling and testing from a diseased organism in order to be able to clarify the exact cause, focus, and profile of disease. Professor Rapoport: "New developments and methods of modern physics like laser technology, electron microscopy and chemistry play an important part in these developments. Without molecular biology, genetics and tissue culturing, other disciplines and in the future even clinical medicine, could no longer get along." Because, the scientist emphasized, it is absolutely necessary to gain and promote scientific growth in such areas as anatomy, physiology, biochemistry and neurosciences. The Society for Experimental Medicine takes this into consideration by awarding the Johannes-Muller prize every 2 years to outstanding young scientists.

The Society for Experimental Medicine today has about 3,000 members.

9280
CSO: 2302

EFFECT OF MAGNETISM ON MOLECULE, CRYSTAL STRUCTURE STUDIED

Leipzig LEIPZIGER VOLKSZEITUNG in German 22-23 Sep 79 p 10

[Article by Prof Dr Wolfgang Windsch, Physics Department, Karl Marx University: "Magnetic Field Reveals Molecules"]

> [Text] Probably everyone is familiar with the mysterious force which works at a distance on iron and other magnets and which works through wood, glass and other materials. That one, with the aid of magnetism, can investigate the elementary structure of molecules and crystals is, however, only known to specialists. Knowledge of these structures is extremely important for understanding the mechanics of chemical processes and for using them in industry. In Leipzig the High-Frequency-Spectroscopy Methods and Diagnostics Center is involved with such problems, and during the just concluded Ampere International Colloquium sponsored by the center, it was able to demonstrate its capability.

Electrons and atomic nuclei possess a magnetic moment and a spin. Therefore, they behave in a magnetic field like a gyroscope under the action of gravity: The magnetic field tries to aline the magnetic moment parallel to the lines of the magnetic field, as in the case of the compass needle. As a result of spin, forces arise--as with a child's gyro top--which cause a motion (precession) of the gyro axis about the direction of the magnetic field lines. The frequency of this precession is a measure for the strength of the magnetic field and for the magnetic moment of the electron or atomic nucleus.

Information Through Spectroscopy

With the aid of a high-frequency magnetic field whose frequency is equal to the precessional frequency, the magnetic moments of these elementary magnets can be reoriented; then we speak of resonance. The magnitude of the energy quantum required for this provides us information about the properties of these elementary magnets and their response to forces in

their neighborhood; spectroscopy utilizes these properties. Atomic nuclei and electrons are, of course, only isolated from one another in exceptional cases. As a rule they form, together with other elementary particles, atoms, molecules, crystals and liquids; these exert forces on each other.

The methods of magnetic resonance for manipulating this interaction in condensed systems were discovered in Kasan in 1944 by the Soviet physicist Savoyski and have become during recent decades a valuable tool for explaining the microstructure of materials.

We distinguish between electron paramagnetic resonance (EPR) and nuclear magnetic resonance (NMR). Let's look at several examples. In molecules and crystals, electrons have a propensity to mutually balance their magnetic moments. For this reason, most bodies are nonmagnetic. By external excitation--for example, by irradiation with ultraviolet light or X-rays, by chemical reactions or by distortion of the crystal lattice by inserting foreign atoms--this equilibrium can be upset. Then we can demonstrate electron paramagnetic resonance.

An important application is the study of chemical reactions. In this process, intermediate products, the free radicals, with increased reactivity can be produced. These possess a net magnetic moment. For the properties of the end product of an industrially used chemical reaction, the location of this center of activity within a balanced molecule is of vital importance. For example, in the production of high polymers, if it is located in a side-chain molecule, increased crosslinking and increased temperature stability can be expected. Specific properties of high-polymer materials are achieved through copolymerization, that is the common polymerization of several starting materials. Knowledge of the position of the radicals is important here, also, for controlling the polymerization reaction. The stability of the end product is degraded if it still contains such highly reactive radicals.

Even though electron paramagnetic resonance is so sensitive that it can detect free radicals and crystal distortions to 1 part per billion or even greater, this sensitivity is still not good enough for many industrially used reactions and many investigations on materials for new structural elements. In connection with this, numerous problems remain to be solved in the area of scientific equipment construction--this is one objective of the work at the High-Frequency-Spectroscopy Methods and Diagnostics Center. Nuclei of hydrogen atoms are exceptionally well suited for the investigation of nuclear magnetic resonance, and for this reason it has become a valuable investigatory technique for organic chemistry. But also, nuclei of fluorine, phosphorous, the rare carbon 13 and of many metals have in recent years become amenable to study, so that, along with other branches, fluorochemistry and plant-protection chemistry use this method.

The structure of molecules, their interaction with catalysts and their mobility state in polymers or in crystals are important characteristic

values for basic science and applied technology. This explains our close cooperative work with the VEB Leuna Works and the VEB Petrochemical Combine Schwedt. One can trace the diffusion of ions through cell walls with this method and thus obtain valuable information about important life processes. An effort is now being made to apply this capability to the investigation of tumors.

Significant for the application spectrum is the increase in resolution--the capability to detect the smallest structural variations--which has been achieved during the past 2 decades.

Thus it is possible in the case of n-dodecane, a chain-like hydrocarbon with 12 carbon atoms, to demonstrate the really small differences in the chemical bonding characteristics between the individual carbon atoms. If we could carry this accuracy over to the measurement of distance, it would mean that the distance from the Leipzig University high-rise to the Berlin Television Tower could be determined accurate to 1 millimeter.

High Utilization Required

For even better use of our capabilities in the interest of the people's economy, 3 years ago the High-Frequency-Spectroscopy Methods and Diagnostics Center was founded. The support of all users of magnetic resonance in industry, the universities and academia is an important objective. High-frequency spectrometers are very expensive and require high utilization, and their effective use presupposes a high level of knowledge. The special training of students and advanced training of practitioners--especially from the chemical industry--is also among the tasks of our Methods and Diagnostics Center.

9160
CSO: 2302

SYNTHETIC CRYSTALS PRODUCED FOR SCIENCE, INDUSTRY

Growing Significance

Leipzig LEIPZIGER VOLKSZEITUNG in German 13-14 Oct 79 p 15

[Article by Andreas Engelhardt: "'Natural Wonders' From the Crucible--Growing Significance of Synthetic Crystals Cultivation for Science and Technology"

> [Text] Cultivated crystals are becoming increasingly important to science and technology. They are used in particular for basic research into improved opto-electric assemblies like synthetically prepared strontium-barium niobate crystals from the Central Institute for Optics and Spectroscopy of the Academy of Sciences of the GDR. The crystals obtained from a hot melt at temperatures above 1,000°C belong among the cultivated crystals for laser research, like the three blank crystals of gadolinium gallium gramate.

Gems and other rare minerals which have beautiful crystals are still seen today in museums and mineralogical collections as wonders of nature. But synthetically prepared crystals are often as valuable as large carat diamonds because crystals grown in nature with a uniform lattice structure have long been of insufficient quality and quantity to satisfy the demands of science and technology. As a result of the use of the semiconductor materials germanium and silicon for electrical assemblies--specifically in microelectronics--the cultivation of high purity crystals with special properties like direction-dependent electrical conductance and heat conductance capabilities on an economically feasible scale underwent a complete revolution. Since the discovery of the laser effect and its multiple uses, for instance, the ruby laser, synthetic monocrystals have also become indispensable as optical assemblies. New branches of science like nonlinear optics came into being and research in the area of optics and spectroscopies was accelerated significantly by synthetically prepared crystals.

Scientists and technicians at the Central Institute for Optics and Spectroscopy of the Academy of Sciences of the GDR are working on perfecting known crystal cultivation methods and on the preparation of new laser crystals. For cultivation, the Czochralski method is used primarily. Here, a crystal germ is immersed in a melt and a substnace is crystalized on the germ under constant rotation. Simultaneous with the rotation, a slow upward pulling of the germ takes place. Crystals up to 250 mm in length can be drawn out of a 1,000°C hot melt in a high-frequency heated platinum crucible.

The direction of rotation and rate of pulling are decisive for the quality of the cultivated monocrystal. These are in turn dependent on the material added (inoculated) to the crystal in order to impart characteristic properties like light emission of certain wavelengths. Most recent research at the Berlin Central Institute is directed toward bismuth germanate as a crystal with the element neodymium as additive. Neodymium replaces bismuth in the crystal lattice during the cultivation procedure. By using such crystals as optical components in lasers, light with a wavelength of 1.06 micrometers is transmitted and this cannot be perceived by the human eye. Studies on these crystals provide new insights into laser physics and promote basic research for numerous new areas of application from data transmission to material processing.

In the Moscow Lebedev Institute of Physics of the Academy of Sciences of the USSR, neodymium-dosed crystals are being used in the exploration of laser-controlled nuclear fusion as optical components in the excitation lasers. Even in the United States and Japan, scientific research in the area of nuclear fusion is under way with neodynium-glass lasers, which presently have the best parameters.

By addition of other rare earths, for example erbium or holmium, which is also being explored at the academy institute at Berlin, crystals for other wavelengths are being prepared. Furthermore, work on perfection of electro-optic assemblies made of strontium-barium niobate is a part of the research program.

Examples of Use

East Berlin NATIONAL-ZEUTUNG in German 27-28 Oct 79 Supplement p 3

[Article signed 'A.E./wds': "As Valuable as Large-Carat--Crystals for Science and Industry Produced in New Ways"/

[Text] Gems and other rare minerals which have beautiful crystals are still admired today in museums and mineralogical collections as natural wonders. But synthetically prepared monocrystals are often just as valuable as large-carat diamonds. Because crystals grown in nature have long been of insufficient quality and quantity to satisfy the demands of science and technology.

The solution? Planned production of monocrystals by industrial methods in special crystal cultivation systems.

But what are monocrystals? Simply stated, they can be imagined thusly: a set of monkeybars on a childrens' playground consisting of rods of equal length having spheres of equal size connected together at uniform separation, the entire thing being shielded by a mantle of exact geometric cross-section (round, multifaceted).

The spheres would stand for atoms, the rods for bonding forces between them which keep everything at the "proper separation." Naturally all impurities must be eliminated within the sheath. Only in this manner would we have an ideal monocrystal as required increasingly today by science and technology.

Modern electronic instruments like black-white and color TV equipment, stereo radio receivers, recorders and record players, and also pocket, table and large computers, would be impossible without monocrystals as starting materials for components and assemblies. In these microelectronics systems, monocrystals made of germanium or silicon and several other chemical elements play an important role. They have a pronounced direction-dependent electrical conductance; monocrystals can thus be used as rectifiers for various types and intensities of current (low, medium, and high frequency) as well as in special circuits as amplifiers or special assemblies as electronic memories (computer technology).

Furthermore, with the discovery of the laser effect and the development of its manifold uses, semiconductor monocrystals have become increasingly important as optical components. The area of so-called nonlinear optics, also called quantum optics, has developed; here, certain interactions between light particles and solid bodies like monocrystals are studied and utilized technically.

Scientists of the Central Institute for optics and Spectroscopy of the academy of Sciences of the GDR are working on perfecting known crystal cultivation methods and on the preparation of new monocrystals for laser technology. For cultivation, the so-called Czochralski method is used primarily. Here, a high-purity crystal germ is immersed in a melt and a substance is crystallized onto the germ under constant rotation. Together with the rotation, a slow upward pulling takes place. In this manner, crystals up to 250 mm length can be drawn from a hot melt at temperatures above 1,000°C. Direction of rotation and drawing speed as well as purity of the melt are decisive factors affecting the quality of the cultivated crystal, its electrical and optical properties.

The properties of a monocrystal can be varied within certain limits in a particular direction by replacing certain atoms (spheres in the example mentioned above) by atoms of another chemical element. This complicated process is called dosing (inoculation). We can imagine this as follows:

in our monkeybars mentioned above which, for the sake of simplicity, we will imagine to consist exclusively of aluminum, individual spheres are replaced by wooden spheres after dosing. Thus the entire configuration receives strength, elasticity and other properties which differ from those of the original monkeybars.

Naturally this is a very complicated procedure when cultivating monocrystals and requires an accurate knowledge of many physical-chemical regularities of crystal configuration. But in this manner it is possible to create new, better monocrystals with characteristic properties for specific uses.

For instance, in the Central Institute for Optics and Spectroscopy, research is underway with bismuth crystals into which the element neodymium has been inoculated. By this we succeed in preparing an optical component which, when used in a laser system, will transmit light at wavelengths which cannot be seen by the human eye. Work with these new semiconductor materials is valuable both for basic research and for practical scientific-technical applications because these monocrystals have uses ranging from data processing in electronic computers to direct material processing (e.g. minute drilled holes).

These few examples illustrate that monocrystals belong among the most promising components for electronics and optics for the near future.

9280
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FUNCTIONS OF CENTRAL WEATHER SERVICE OUTLINED

Potsdam MAERKISCHE VOLKSSTIMME in German 21 Sep 79 Supplement p 7

[Article by Guenter Blume, meteorologist: "Weather Predictions by Satellite; Central Weather Service in Potsdam Furnishes Information for Smooth Functioning of Many Areas of Our Economy"]

[Text] Weather predictions of the meteorological service of the GDR are prepared by the Central Weather Service in Potsdam and by other weather service centers in the republic and are announced by the weather information service of the GDR post office, by radio and in the press and on GDR television. This is a part of our everyday experience.

The foundation for this was laid on 1 April 1946 with the creation of the weather service department of the Potsdam central observatory. An order by Marshall Sokolovski on organization and work in the area of meteorology made advancement of the weather service possible (order issued on 24 June 1946).

At that time the initial data needed for analysis and weather predictions could only be received and announced on the basis of radio approval issued by the occupying powers. There has been continuous teletype communication within the GDR since 1953 and with foreign cities, for instance, Prague, Warsaw or Moscow, since 1955. After the construction of a new building on the Michendorfer Chaussee, the Central Weather Service Center--which developed from the weather service department of the central observatory--has been integrated for many years into the worldwide communications system of world weather watch (WWW).

Continuous Monitoring by Radar and Satellite

Even though today ground weather observations from the territory of the GDR are available every hour and altitude weather reports from radio probe release centers are available for evaluation every 6 hours, the Central Weather Service, performing the function of a national and international information center, receives ground weather observations ev[illegible] hours

and altitude weather messages every 6 hours from the other nations in Europe, parts of North Africa, North America, Canada and Greenland and passes this information on to other nations, together with reports from the GDR.

With the introduction of radar weather information in 1965, a significant improvement in small-area detection of precipitation was achieved, since continuous time-space monitoring of the entire territory of the republic was now possible. At the same time it became possible to conduct better monitoring areas of rainfall like for instance, thunderstorms, particularly with regard to their direction, rate of travel and intensity changes and to use this information for short-term weather predictions (up to 6 hours).

Another significant advance in weather analysis over Europe was achieved in 1966 when daily photographs of polar regions began arriving from orbiting weather satellites. In the meantime, photographs from polar satellites and geostationary weather satellites can be received by the Central Weather Service by means of a special antenna so that cloud distributions (in the visible and infrared range) can be monitored continuously and used for weather analysis and prediction

Computers Help Process Information More Quickly

Formerly, the various detailed meteorological data had been processed manually e.g. entry of weather reports on weather maps or derivation of certain factors for prediction of meteorological parameters. But with the construction of the computer center at the Central Weather Service in 1971, new potentials for preparing and improving weather advisory documents as well as organizational improvements began in stages. By using certain models with this high-performance EDP system, both analytic and prognostic field distributions of meteorological parameters were worked out; these field distributions were either unavailable from other meteorological centers or became available only at a later time. These products are used primarily for 48-hour advance weather predictions. For a 5-day forecast, information processed by other meteorological centers is subject to an objective interpretation by means of EDP and processed for a medium-term weather prediction.

As the management organ of the operating weather service, the Central Weather Service makes important advisory documentation available to the other weather service centers of the GDR, e.g. the ocean weather service center in Warnemunde, the aircraft weather watch in Berlin-Schoenefeld, or the weather service center in Leipzig.

The Central Weather Service coordinates all meteorological reports for the territory of the GDR. The provision of current metoeorlogical information to central state organs is today one of its most important tasks. The Central Weather Service is also the cognizant regional weather service center for the capital city of the GDR and the bezirks of Potsdam, Frankfurt (Oder) and Magdeburg.

Extensive Service to the Public

The weather predictions prepared by the weather service department have always been made available for radio broadcasting to the public. The number of these reports for the GDR, including the capital city and the bezirks, has grown considerably in the course of the last 30 years. Today, their content is also more extensive. In addition to short-range and detailed weather reports, weather reports for vacationers and winter sport areas and road reports are much in demand from the public. Direct conversations between meteorologists employed by the Central Weather Service and a radio moderator also provide the public with valuable weather information--above all in critical weather situations. These direct conversations were initiated and introduced for the first time by studio DT64 in 1964.

In order to give the public a better picture of expected weather conditions, on 22 December 1952, in cooperation with GDR television, transmission of a TV weather report took place for the first time; its format has been continuously modernized over the years.

Another significant information potential has existed in Berlin since 1953 due to the creation of the weather information service of the German post office. In the meantime this system has been expanded to cover nearly the entire territory of the GDR and has been coordinated with the demands of the construction industry, for winter road service and tourism (foreign and domestic). This service is used annually by more than 1 million callers in the capital city of the GDR alone.

Energy Use After Weather Predictions Promotes Conservation

The significantly increased demand for meteorological predictions comes from industry, energy management, construction, transportation and socialist agriculture.

It is being increasingly recognized that in many spheres the planning and sequence of production is decisively influenced by meteorological parameters. For instance, since 1967 or 1969, special predictions have been prepared by the weather service department and made available to the central dispatcher service for generation of gas or electrical energy. In recent years, detailed predictions of meteorological parameters have been included in process calculations by several energy combines for the generation of remote heat. This has permitted the companies to conserve valuable fuels, like heating oil, and thus to save a certain amount of foreign exchange.

Among the users of meteorological predictions in Potsdam Bezirk are the beverage combine in Potsdam and the Bezirk Directorate of the HO [state trade organization], which includes medium-term weather predictions on Wednesday into their planning for goods deliveries to restaurants on week-ends.

Storm Warnings and Weather Predictions for Planting and Harvest

Besides the regular preparation and transmission of weather reports, issuance of weather warnings before certain threshold values for meteorological parameters are exceeded--like for instance, peak winds greater than 15 m/s or icy road conditions--belongs in the sphere of the Central Weather Service. These warnings are given at the right time to central organs of the economy and state apparatus for their use and help in the timely introduction of precautionary measures in critical weather situations and thus reduce or completely eliminate any damage.

Important consultation services are provided to socialist agriculture. This includes for instance, the provision of meteorological data for forecasting the beginning of the spring planting, for working out irrigation estimates, for the determination of optimum employment times for harvesting machines, for working out optimum planting schedules for winter grains or for the application of fertilizers or plant protectives.

9280
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POSTAL SERVICE TO ADAPT TO LINE SWITCHING DATA TRANSFER NETWORK

Budapest INFORMACIO ELEKTRONIKA in Hungarian Vol 14 No 6, 1979 pp 304-307

[Article by Pal Horvath, group leader, Data-Transmission Group, Central Telegraph Bureau, Hungarian Postal Service]

[Text] In the fourth issue of the 1976 volume of this journal we already discussed the data-transmission services of the Hungarian Postal Service. Then, we discussed primarily the possibilities that existed; however, we also touched briefly upon development plans. Since that time, the plan described has reached the realization stage (this is the theme of this article), and the number of data stations increased. The rate of growth of more than 40 percent per year seems to have stabilized.

Being aware of the importance of the service and considering the justified criticisms and experience, the Postal Service exerts great effort toward improving the quality of its service.In addition to numerous measures implemented in the recent past, the plan described in this article will contribute toward the assurance that the Postal Service will continue to promote the spreading of remote data processing. (Manuscript received 15 August 1979.)

Needs and Potentialities

All those involved have been aware of the plans of the Postal Service concerning the data-transmission network. In December 1978, the general directorate of the Postal Service signed an agreement with Budavox, according to which the latter institution cooperates with Nippon Electric of Japan to implement the importation of the Budapest electronic telex and data center, as well as the startup of the imported equipment, from Japan.

The subscribers need broader and much higher quality service than they are presently receiving. For this reason the Postal Service intends to procure equipment which is capable of meeting this need.

Provision of the new services was facilitated by the fact that the Postal Service was compelled to switch to a new system in the area of telex centers since the equipment used until now is no longer being manufactured. Since the electronic telex centers also permit the switching of asynchronous data signals up to 300 Baud, the new telex centers had already a built-in data-transmission capability to some extent. However, the increasing needs necessitated the selection of a system which is capable of ensuring the transmission rate and services usually employed in all line-switching networks.

In December 1976 the Postal Service sent invitations for bids to all major firms asking them to propose the delivery of line-switching centers and the associated data-network equipment for telex, gentex (international postal telegraphy network), and domestic postal telegraphy systems, as well as for the switching of asynchronous and synchronous (more precisely: anisochronic and isochronic) data signals. A condition of the invitations to bid was that the firm must also be prepared to sell the licences for the equipment offered. The committee assigned to evaluate the responses selected, on the basis of the technical specifications and economic considerations, the Type NEDIX 510A center from the NEC corporation.

The investment is basically telex-centered insofar as the switching center is concerned since there is a major difference between the telegraphic and data-transmission line numbers of the center. The marriage of the telex and data features is likely to be a successful one since the two services have many features in common, and at the same time the combined switching system is more economical. The telex service is known to be a useful service of the Postal Service. It is hoped that its new "junior partner" will also deserve the satisfaction of the users.

The new data network will be available to subscribers from early 1980 onward. Compared to the initial configuration, the network will gradually expand in terms of capacity and service performance. This article describes only the initial configuration of the system.

An important aspect of planning was that the system must conform to the applicable international standards and recommendations. The major parameters of data networks are specified in CCITT X recommendations (Orange Book, 1976).

Various changes have since taken place, modifying some of the provisions of the Orange Book in its initial edition. The modifications can be seen from the publications of the 7th Study Group of the CCITT.

Characteristic Features of the Services

The following among the subscriber services described in CCITT X. 1 recommendation will be available:

a) Asynchronous classes

Class 1. The data-transmission rate is 300 bits per second; start-stop transmission; 11-bit character structure (1 start bit, 8 information bits, 2 stop bits); connection establishment via the alphabet characters of CCITT No 5; selection signals at the 300 Baud rate.

Class 2. Start-stop data stations using the rates of 50, 100, 110, or 200 Baud for data transmission and connection establishment are in this class. The 50 and 100 Baud subscribers select via the alphabet CCITT No 2; those using 110 and 200 Baud, select via the No 5 alphabet. A character of the 50 and 100 Baud signals consists of 7.5 elementary signals; one of the 110 and 200 Baud signals of 11 elementary characters.

b) Synchronous classes

Class 4. Data-transmission rate is 2,400 bits per second.
Class 5. Data-transmission rate is 4,800 bits per second.
Class 6. Data-transmission rate is 9,600 bits per second.

In all synchronous classes the selection takes place at the appropriate data-transmission rate via CCITT No 5 alphabet. Class 3 service will not be initially provided by the Postal Service since synchronous applications at 600 bits per second are not presently expected.

The data subscribers belonging in the individual classes may use those functions of the system as a basic service which provide connection between the calling and called part[illegible]fter entry of the full (six-digit) calling number. The system is ca[illegible]providing numerous additional, so-called special services. They may be [illegible]ouped in two categories:

- Special services available for the duration specified in the contract (they may be used in all calls during the period);
- Special services requested in individual cases by calling an appropriate special signal sequence in the center.

The following are the special services provided by the system in the first category:

Direct Calling

After signalization of the intent to call (for example by switching from binary 1 to binary 0 on the data line in case of start-stop connection), the center connects the caller subscriber with a subscriber having the call number stored in the switching center, without the entry of a call number. Insofar as simplicity and speed of the establishment of the connection is concerned, this approach features the properties of the leased circuits; however, it additionally provides more flexibility since the partner capable of being called may be simply changed by an operator command. An important fact is that the direct calling connection may also enjoy the advantages arising from the advanced maintenance system of the switched system connections.

Closed Subscriber Group

The closed subscriber group is a freely selectable group formed from among the subscribers in the same class who may establish connections with each other but cannot call subscribers outside the group, nor can those outside the group establish connections with those inside the group. The data station may be a member of at most two groups.

Closed Subscriber Group With Outgoing Calling Right

Any data station belonging to a closed subscriber group may be allowed to establish a connection beyond his group with data stations in the same category outside the group.

Identification of the Calling Line

The switching center displays the call number of the calling station to the called station before establishing the connection. The called party may decide whether it desires to establish data transmission with the caller.

Identification of the Called Line

Before establishing the connection, the switching center displays the call numbers of the called station which has accepted the call to the calling

station. The caller may check whether the numbers entered by him were distorted or not during the transmission (the selection signals are secured only by parity control), and whether the center has established the right connection.

Series Number

Many line-handling data terminals (for example multiplexers and front-end processors) may be called (up to 16) if they are in the same category by a single call number. The center locates the free connection from among the connections in the series.

The system will not initially provide subscriber services of the second category. However, the list of possible services in this category widens all the time.

The following services, for example, may be included here:

Abbreviated calling (calling with fewer than six digits).
Multiaddress calling. This allows simultaneous transmission of data to more than one called station. The called parties may be designated by their call numbers, or they may be stored in the center in advance.

Billing to the Account of the Called Subscriber

Establishment of Connection After the Called Party Ceases to Be Busy

The switching center inhibits the establishment of connections between subscribers in different service categories; however, it does not discriminate between subscribers using different transmission rates.

The data stations of the present DATEX system, classified in the 2d category, may continue to operate without change in conditions: dial selection via the U.1.B. signaling system, no restrictions on character structure, speed rates up to 200 Baud, and minimum rate limited only by the disconnect criterion (continuous start polarity lasting for more than 300 msec).

The System Engineering of the Data System

The initial, single center configuration of the data system encompasses all elements required for the establishment of a network of larger size.

The data system solves both the switching tasks and the network multiplexing tasks on the basis of the time-sharing principle.

The use of the time-sharing principle for switching and transmission functions permitted the joint optimization of the switching and transmitting subsystems of the data-network system. The center-side pairs of the multiplex devices emplaced at remote points of the network were integrated into the time-sharing switching field (they became transmultiplex). The data-multiplex group carrier (bit flow transmitting the signals of several data channels according to CCITT.X.50. recommendation by multiplexing) is PCM-compatible in its interface (same or opposite direction V.11 or G.132 electrical parameters) and in its speed (64 kpbs); however, it also matches to baseband (GDN type) and basegroup band (V.36 recommendation) line signal converters. The units receiving individual subscriber calls are identically structured in the center and in the local multiplexers, and are equally suitable for baseband (up to 20-25 km range), audio-frequency, and analog-modem subscriber connections.

Servicing of the synchronous subscriber operations is via a synchronous network, which permits the effective utilization of the time-sharing switching field synchronous to it since one switching bit is required for the switching of a subscriber bit.

The asynchronous data stations, with a rate of up to 300 Baud, may be connected to the center individually, via baseband or modem connection, or, according to Version B of CCITT R.101 recommendation, via code- and rate-dependent multiplex devices. Concentrators of the R. 101 type are also available for the economical connections of asynchronous subscribers.

Connections among the asynchronous subscribers are established by the center in an asynchronous manner, by multiple sampling (64 times per elementary signal), switching code combinations determining the generated signal patterns or the temporal situation of the signal transitions (combinations obtained by means of so-called signal-transition coding), as well as re-establishing the elementary signals at the connection of the called unit. Either asynchronous switching mode is independent of the code structure, and permits rate-independent operation up to a rate which considerably exceeds the nominal.

The switching field is a bit switcher with small delay time; a time-sharing bus-type hardware. The role of the central processor is filled by a special, 16-bit dual processor with a maximum capacity of 2M words and an operational memory having a cycle time of 300 nsec. The organization is

of the hierarchical control type: Microcomputers perform many of the partial tasks. There is a lamp panel or display and there are several teletype units for displaying the status of the system and for displaying written messages from it. The users may communicate with the system via a wide range of commands. The reliability of the hardware may be expressed by the MTBSF of 58 years. Highly reliable electronics and programs handle the hardware and software faults (which can sometimes also occur with the "injected" programs) by means of automatic system reconfiguration and restarting.

The Subscriber Interfaces of the Data Network

The CCITT has developed switching modes significantly deviating from the V-series interfaces used until now for the connection of the data-network terminal units. The functions of the interface circuits are determined by Recommendation X. 24; their electrical parameters by Recommendations V. 10 and V. 11; the connection - establishing procedures by Recommendation X. 21 (for synchronous data stations) and Recommendation X. 20 (for asynchronous data stations). The following are the major differences between the V- and X-type interfaces:

- With an X-type interface, all signals of the calling process pass through the DTE (Data Terminal Equipment) and DCE (Data-Circuit Terminating Equipment) surface connections, meaning that every X-type DTE is also an automatic caller.
- The X-type interface uses considerably fewer circuits.
- The algorithm of connection establishment changed and became simpler in comparison to that in a telephone network.
- The noise tolerance of the interface circuits has improved.
- Fifteen-pole connectors are used in X-type interfaces instead of 25-pole ones.

The advantages of the data network can be fully utilized only with X-type interfaces. Considering the fact that there will be very few, if any, X-type DTE's when the network starts operating, while at the same time there will also be a need for connection of V-type DTE's to the data network, the Postal Service provides both X-type interfaces and V-type interfaces (the latter according to Recommendations X. 20 bis and X. 21 bis). The V-type interfaces will be suitable for manual or manual/automatic calling.

Initial Configuration of the Network

As a result of the availability of the network devices described above, the initial configuration of the data network will be a national system, accessible to all subscribers, even during the initial stage. Most of the asynchronous subscribers will be connected to the center via individual line, and some via telegraph multiplexers deployed in regional cities or concentrators. About half of the synchronous subscribers will be connected to the center via multiplexers. Synchronous multiplexers will be deployed in Budapest and regional centers. The regional multiplexers will be replaced with switching centers as the network is gradually expanded, and multiplex connections will become increasingly economical as there will be more subscribers, even in relatively small cities.

Testing Possibilities for the Network Connections

Much emphasis was placed by the Postal Service during system planning on the establishment of complex alarming facilities and loop-testing possibilities. All network devices contain the functions necessary for remote and local testing. The synchronous subscriber devices may be tested up to the PTF-DCE interface; the asynchronous subscriber devices may be tested up to the multiplexer or the concentrator with the aid of remotely controlled test loops operated from the center. Remote testing of the asynchronous DCE's requires subscriber cooperation (the test button must be depressed). The subscriber and trunk lines may be called by commands issued via teletype units in the test room. The center itself is capable of executing many measuring and control functions upon issuance of the appropriate command.

Principles of the Service

In planning the system it was an essential consideration that the Postal Service delimit effectively the computer-technological and data-transfer functions of the remote data-processing networks. Up to and including the well-defined digital DTE-DCE interface, the Postal Service provides all equipment (all are included in the rental), and, for no additional charge, also maintains and repairs the devices provided.

The application of the new data network may be freely chosen; however, the Postal Service favors its use for data transmission applications. The goal of the Postal Service is to achieve that most of the needs can be met by the data system. The data stations presently operating over the telegraph and telephone system may remain on the original system, or, if the subscriber so desires, may be reconnected to the data system.

The Postal Service does not contemplate the engineering reconstruction of the telegraph and telephone networks expressly for data-transmission considerations. The quality of the data-transmission service in these networks will improve primarily as a result of periodical reconditioning and expansion of the basic communication network system. Among the problems still existing in the data-transmission service, most will be solved ultimately when a new data network will be installed in future years, gradually replacing equipment of the present network and also adding to same.

2542
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ADMINISTRATION COMPUTER SERVICE FOR REMOTE DATA PROCESSING DESCRIBED

Budapest INFORMACIO ELEKTRONIKA in Hungarian Vol 14 No 6, 1979 pp 308-312

[Article by Csaba Cserna, group leader, ASZSZ (State Administration Computer Service)]

[Text] This article describes the remote data-processing network of the ASZSZ based on a CII-Honeywell Bull 66/60 data-processing computer. It describes the structure of the network operating the system presently containing 51 terminals and minicomputers, capable of serving 200 lines. It also describes the connection points of the front-end processor (the most important component of the terminal network) and the operation of the network-control system programs. It touches upon possible expansions, as well as upon development results and ideas concerning the network. (Manuscript received 18 August 1979.)

The State Administration Computer Service (ASZSZ) has a remote data-processing system which is a terminal network built around a CII-HB central data processor. The following simultaneously operational remote data processing modes are available in the system:

- Bundled remote processing
- Interactive processing
  - Time-sharing system
  - Transaction-processing system
  - Programmed interactivity
- Message switching

The files of the centralized data base are accessible both from remote bundled and interactive processing.

Below we present the structure of the network, the front-end processor (FNP), and the network-control system programs.

The Structure of the ASZSZ Network

The structure of the ASZSZ network—together with the names of the users—is illustrated in the figure. For the fast simultaneous service the network provides an up-to-date front-end processor and concentrator computer for the up to 200 lines (the network presently comprises 51 terminals and minicomputers), so that the hierarchic structure of the system is ensured by the line speeds employed and the properly distributed buffers.

The network-control functions are performed by a DN 6632 minicomputer, which has the following hardware features: It is capable of executing 485,000 commands per second, thus ensuring real-time service to the environment. The cycle time of its MOS operative memory having a capacity of 32 Kwords (1 word = 18 bits) is 1 μsec. The input/output channel operates independently of the processor, and an interrupt indicates the end of the operation. The computer has 256 interrupt levels. The data-transmission lines connect via several subchannels, each belonging to one of the two communications adapters. The general-purpose adapter of the computer is capable of synchronous and asynchronous channel service; the transmission rate may be as much as 50 bps to 50 kbps. The rate of the subchannels of the asynchronous adapter is up to 300 bps.

The table illustrates the terminals supported or already installed of the front-end processor, as well as the line protocols. Dialog-type terminals and multifunctional computers were installed in the network, thus capable of meeting the users' needs, tasks, and procurement possibilities. The multifunction terminals are minicomputer systems capable of meeting the line-concentration, remote bundled processing, data-carrying, code-converting, and data-recording needs of the users.

From the characteristics of the already installed devices it is evident that our goal was to achieve the required performance with prototype terminals and data-transmission devices capable of being purchased on the domestic market (for example the VTS 56100 microprocessor terminal of our own development and the R-10 concentrator developed at the SZAMKI [Computer Technology Research Institute]).

It is possible, and we plan, to also implement system-external computers (ESZR [Unified Computer System] or IBM compatible)already operated by the users. At the present time, use may be made of IBM Models 360/25, 30, 40, and 50as terminals providing the processing of the remote bundles of our central computer.

Connection Points of the Front-End Processor

Now we describe the interfaces of the front-end processor, which is the central unit of the network insofar as remote data processing is concerned. On the basis of this information we describe the line protocols of the terminals capable of being connected to our system, as reflected by the data in the table. These data also represent the basis of the work concerning the planning for network modernization and development. We discuss the MMI line algorithm of the concentrator computer under a separate heading.

Interface to the Central Computer

The front-end processor is joined to the I/O multiplexer of the central system via direct channel interface, where the data-transmission rate is 1 million bytes per second. Within the operating system, the Network Processing Interface (NPI) combines those software modules which exchange data with the host-handling module of the network controller. The NPI processes the write/read sequence structured in various forms and remote-bundled, as well as output during interactive processing, and carries out the transmission of data between the channels of the two computers.

Line/Terminal Interface

The network-controlling computer is capable of handling a large variety of lines and terminals. It may operate over switched or leased telephone line at transmission rates of 50 bps to 50 kbps in simplex, semi-duplex, or duplex mode. In case of switched lines, it also supports automatic call reception and automatic call initiation. Our system does not provide for the latter. The installed terminals operate with semi-duplex connection. A system program of the front-end processor permits the reception of the input of a terminal while an output is transmitted to another terminal over a duplex line, using a poll/select line protocol.

A conventional start-stop algorithm ensures the operation of the typewriter-like terminals. In our system, the telex subscribers may have access to the services of the time-sharing system through the postal telephpne exchange and the (later to be installed) call receiver. This possibility is a temporary solution for those users who cannot, or presently do not desire, to use a terminal or their own. There are telex stations practically everywhere in the country; however, we all know that data transmission is slow and not entirely reliable with the devices presently in use. The low speed of the transmission and the lack of fault protection restricts also the operation of the other asynchronous terminals.

The most frequently used synchronous terminal of the network, providing point-to-point or multipoint dialog operation, is the device comprising a VTS 56100 screen and printer. It emulates the terminals' line algorithm of the terminals of the CII-HB VIP type.

The network-controlling computer and the terminal continuously exchange messages. If there is no useful information, we have blank message, and if there is data transmission, we have data message. The status message serves for acknowledgment of the data, their repetition, or signaling the busy condition. We have polling and selecting messages in the multipoint operating mode. The task of the polling message is to call on the terminal selected by the computer to transmit messages; with the selecting message we call on the selected terminal via the computer to receive the message. The front-end processor interrogates the terminal entered in the polling table, which has not reported, less frequently. LRC is the fault-protection employed. The IBM 2780 compatible terminals equipped with a Binary Synchronous Communications (BSC) adapter process the remote bundles with the central computer. The code of the data exchange may be EBCDIC and ASCII. LRC and CRC are the fault protections employed.

The Remote Computer Interface (RCI) is the standard synchronous transmission method, using an ASCII character complement, between the front-end processor and the CII-HB minicomputers. The computers may use the remote job entry method. The primary feature of this interface is the concentration of data for minimization of the transmitted information, capability of transmitting records of various lengths, preformed printing and transmission of BCD and binary card records.

Multi Message Interface

The RCP 707 satellite computer has two functions: remote bundled processing and concentration of dialog-type terminals (typewriter or screen keyboard type). The MMI interface establishes the rules of data flow between the concentrator computer and the FNP. At one time, there may be up to six physical connections via switched or leased telephone line, by means of semiduplex or duplex synchronous data transmission. The code of the data exchange is eight-bit ASCII; the fault protection is LRC, VRC. The data flow moving over the physical line contains the message of the logic terminal from the defined concentrated terminals (up to 48 logic terminals per block). The network-controlling software provides for the separation of the block and the transmission toward the dialog-type interfaces is provided by the bundled-message handler. The terminal-controlling modules of of the computer and network-controller software regard the logic terminals as if they were directly connected to separate terminals.

The concentrator computer built into the network contributes toward efficient operation and allows proper utilization of the relatively high-speed lines. The response times become shorter, and the handling of the terminals and lines by means of elastic software relieves the front-end processor.

Based on this approach, we desire to concentrate the terminals performing the dialog and the processing of remote bundles onto a TPA computer.

Network-Controlling System Programs

CII-Honeywell Bull was the first firm to develop the processing concept for networks [illegible] front-end processor. At the present time, two network-controlling system programs are operational.

- General Remote Terminal Supervisor (GRTS) is a memory-located network-controlling software of simple structure, having short response time. It consists of terminal-handling modules built around an executive. The executive handles the incoming interrupts in a real-time fashion, and establishes a priority sequence for the processing on the basis of incoming identification and status information. The executive also provides those service functions capable of being used by all terminal-handling modules such as dynamic buffer handling, timing, and maintenance of the processings waiting both with and without timing. The terminal-handling modules perform line and terminal control, connection establishment and disconnection, compilation of the messages, decompilation, processing, and transmitting messages, data conversion, diagnostic functions, and fault elimination.

The system offers on-line testability, monitoring, and monitor functions written on a screen keyboard type terminal. The GRTS operates reliably ever since it was first used; the problems, as we see them, represent difficulties which are inherent in any GRTS. One such difficulty is the lack of memory protection. Once the GRTS becomes damaged, the fault may be delimited by memory dump analysis. In this case the system program must be reloaded from the central computer, meaning that the system cannot be restarted automatically. It became clear already during installation that the size of the front-end's operative memory is a limiting factor.

We carried out the combination of the many modules, handling a variety of terminals—as part of the design function—by generating several system programs (taking the users' needs into consideration), which are called up as needed. The system programs, of various configurations, may be

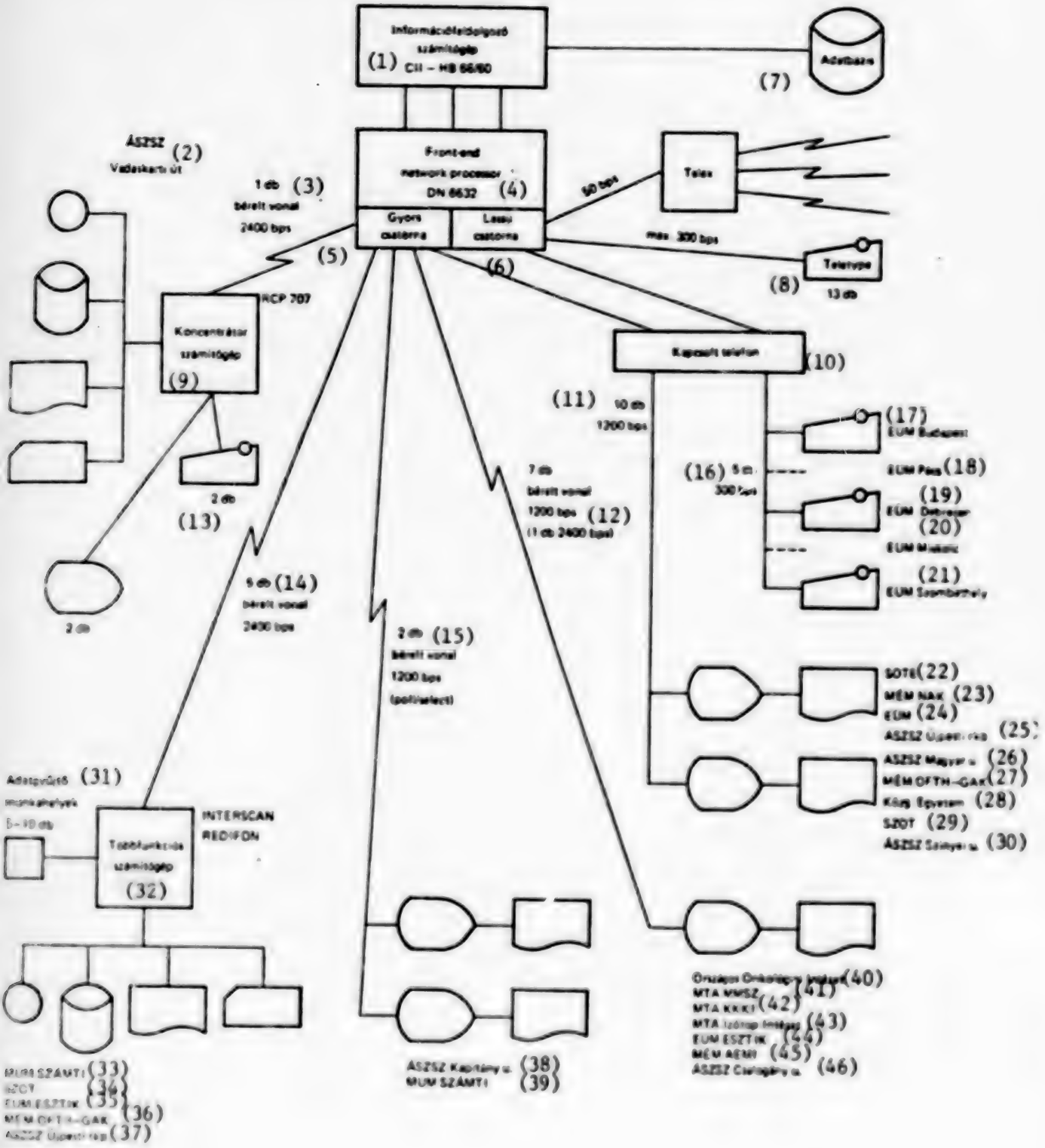
compiled by the central computer with the aid of a simulator. In the course of the development we set up a permanent file structure for the GRTS operating system, on which we deployed the source-language and subject-coded system modules, the system modifications that became necessary during the interfacing, and the jobs related to the generation, filling, and maintenance of the system. These jobs may be run both in the time-sharing system and in local batch processing. In this manner the generation process became more efficient and more elastic. Further development of the GRTS is considerably restricted for the reasons outlined above; thus, we plan to double the size of the operative memory.

- Network Processing Supervisor (NPS) is a higher-level system program, with its own disk memory, using stack and reentrancy technique. It contains new network-controlling functions. The memory is separated into a resident sector and an overlay sector. In designing the NPS our primary goal was the creation of a message-coupled system. The task of the software is to transmit the message coming from the source station onto one or more target station(s). The station—the term being used here as a logical concept—may be a terminal or a program running on the central computer. Handling of the messages is unified within the system; we have to do with the communication lines and terminals only while the message is received and issued.

Comprehensive message coupling may be realized with the aid of the NPS network controlling program among the terminals, or between the central computer and the terminals. The message coupler operates on the basis of the storage-transmission principle, meaning that the computer stores the messages before handing out in their entirety on the disk unit of the front-end processor. The message coupling establishes the queuing data exchange between the central computer and the other terminals in interactive operation.

The NPS may log the messages entering the terminal network in any processing mode. (As a basic interpretation, it records the incoming jobs of the remote bundled processing, as well as the message-coupling and transactional processing on disks.) The NPS collects statistical data about the network events, for example about the line terminal traffic, fault on the lines and the terminals, and the length of the queues.

With the aid of the network-controlling and monitoring terminal we may follow the data traffic of any selected station, may monitor the system status, may place the stations into on-line or off-line mode, may disengage any line, may reengage any line, may dynamically change the data traffic of the network, and so forth.



[Key on next page]

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1. Data-processing computer, CII - HB 66/60
2. ASZSZ, Vadaskert Street
3. One leased line, 2400 bps
4. Front-end network processor, DN 6632
5. High-speed channel
6. Slow channel
7. Data base
8. Thirteen units
9. Concentrator computer
10. Switched telephone
11. Ten units, 1,200 bps
12. Seven leased lines, 1,200 bps (one, 2,400 bps)
13. Two units
14. Five leased lines, 2,400 bps
15. Two leased lines, 1,200 bps (poll/select)
16. Five units, 300 bps
17. Ministry of Health, Budapest
18. Ministry of Health, Pecs
19. Ministry of Health, Debrecen,
20. Ministry of Health, Miskolc
21. Ministry of Health, Szombathely
22. Semmelweis University of Medical Sciences
23. Ministry of Agriculture and Food, further expansion unknown
24. Ministry of Health
25. ASZSZ, Ujpest Quay
26. ASZSZ, Magyar Street
27. Ministry of Agriculture and Food, National Geodesy and Cartography Bureau, Computerized Data-Processing Center
28. University of Economic Sciences
29. National Council of Trade Unions
30. ASZSZ, Szinyei Street
31. 5-10 data-collecting stations
32. Multifunctional computer
33. Ministry of Labor, further expansion unknown
34. National Council of Trade Unions
35. Ministry of Health, further expansion unknown
36. Ministry of Agriculture and Food, National Geodesy and Cartography Bureau, Computerized Data-Processing Center
37. ASZSZ, Ujpest Quay
38. ASZSZ, Kapitany Street

[Key continued on next page]

[Key continued from preceding page]

39. Ministry of Labor, further expansion unknown
40. National Institute of Oncology
41. Hungarian Academy of Sciences, Cooperative of Hungarian Farmers
42. Hungarian Academy of Sciences, Central Research Institute of Chemistry
43. Hungarian Academy of Sciences, Isotope Institute
44. Ministry of Health, further expansion unknown
45. Ministry of Agriculture and Food, further expansion unknown
46. ASZSZ, Csalogany Street

	A terminálok típusa (1)	A kiszolgált vonalak (2)			Az átvitel típusa (3)		Az információcsere kódja (4)					Átviteli sebesség [Baud] (9)	Az összeköttetés módja (10)		A vonali protokoll típusa (13)	Az ÁSZSZ hálózatban eddig installált terminálok darabszáma (14)
		5 Kapcsolt telefon	6 Bérelt telefon	7 Kapcsolt telex	8 Szinkron	Start–stop	ASCII	EBCDIC	BCD	BAUDOT			közvetlen (11)	poll/select (12)		
Írógép típusú terminálok (15)	Teletype 33, 35, 38		x			x	x					110	x		Start–stop	2
	Teletype 28	x	x			x				x		75	x			
	VT 340 display		x			x	x					300	x			13
	IBM 2741	x	x			x		x	x			134,5	x			
	GE terminet 300	x	x			x	x					110/150/300	x			
	GE terminet 1200	x				x	x					300/1200/	x			5
	Telex			x		x				x		50				
Képernyő billentyűzet típusú terminálok (16)	HwB VIP 7750		x		x		x					2400	x		HWB Visual Information Projection	1
	HwB MTS 7500		x		x		x					1200	x			1
	VTS 56100 + (HwB VIP 7700 emulátorként) (17)	x			x		x					1200		x		10
			x		x		x					1200	x			8
	+ nyomtató (18)		x		x		x					1200		x		5
	BTT 7340		x		x		x					1200	x	x		
Többfunkciós távoli kötegelt feldolgozást biztosító számítógépek és terminálok (19)	INTERSCAN GCS 2100		x		x		x	x				2400	x		IBM Binary Synchronous Communication	4
	REDIFON SEECHECK		x		x		x	x				2400	x			1
	IBM 360/ 25, 30, 40, 50		x		x		x					1200–50K	x			
	IBM 2780	x	x		x			x				1200–9600	x	x		
	KCP 702 (HwB)	x	x				x					1200 felett	(21)		•	
	G 115 (HwB)		x				x					1200 felett	(21)			
Koncentrátor számítógépek (20)	RCP 707 (HwB)		x		x		x					2400 (felett)	(22) x		••	1
	ESZ–1010 (R–10)		x		x		x					2400 (felett)	(22) x			
	RCP 707/HDLC		x		x		x					2400 felett	(23) x		ISO HDLC	

• = HwB *R*emote *C*omputer *I*nterface

•• = HwB *M*ulti *M*essage *I*nterface

[Key on next page]

[Key for table on preceding page]

1. Terminal type
2. Lines served
3. Transmission type
4. Code of data exchange
5. Switched telephone
6. Leased telephone
7. Switched telex
8. Synchronous
9. Transmission rate (Baud)
10. Method of connection
11. Direct
12. Poll/select
13. Line protocol type
14. Number of terminals so far installed in the ASZSZ network
15. Typewriter-type terminals
16. Screen-keyboard type terminals
17. VTS 6511 + (HwB VIP as 7700 emulator)
18. + printer
19. Computers and terminals providing multifunctional remote bundled processing
20. Concentrator computers
21. More than 1,200
22. (More than) 2,400
23. More than 2,400

The NPS performs periodic checkpoint memory writeouts; thus, the system restarts automatically after a fault. A major advantage of the NPS is that it can be developed in an elastic manner. System-foreign terminals can be easily adapted since we may define new message formats in a high-level system-programming language, and may also generate new message types and line protocols in the NPS.

We lack sufficient data for a full comparison of the GRTS and the NPS since the NPS is presently run experimentally.

Insofar as we now know, we must pay for the modernity and convenience of the NPS by a relative increase in the response times. Provided that the users need the processing mode realizable with the NPS, the message switching, we will introduce the system. It would be an up-to-date remote data processing if we could connect with the ASZSZ terminal network to the autonomous network of other users. We are presently still investigating the extent to which our network controller operated with the NPS is suitable for this.

2542
CSO: 2502

VIDEOTON DISPLAY TERMINALS COMPATIBLE WITH CII-HONEYWELL BULL

Budapest INFORMACIO ELEKTRONIKA in Hungarian Vol 14 No 6, 1979 pp 314-315

[Article by Odon Kovacs, group leader, ASZSZ (State Administration Computer Service)]

[Text] In the remote data processing system of the ASZSZ, described in the preceding article, the CII-HB compatible VIDEOTON display terminals play an important role. They were developed (matched to the CII-HB 66/60 system) by the ASZSZ, within the framework of a cooperation and development agreement between VIDEOTON and ASZSZ.

So far, the VIDEOTON-made VT 340, VTS 56100, and VDT 52100 terminals were matched. An illustration shows the possible terminal configurations. (Manuscript received Aug. 18, 1979.)

Interfacing the Asynchronous Display (VT 340)

We were able to interface the VT 340 teletype-compatible asynchronous display terminals installed in the immediate vicinity of the computer room with minimum hardware modifications. Because of the proximity of the computer, using the EIA (Electronic Industrial Association) interface used by Honeywell or the comparable V-24 interface, the hardware modifications of the VT 340 displays included only relatively simple code conversion, matching the different interface, and realization of the asynchronous break function which was originally lacking in the VT 340 display.

The code conversion was needed since the VT 340 display lacks lower-case characters, yet the front-end processor also used the lower-case characters of the ASCII code complement in the Honeywell equipment.

The break function, ensuring one of the basic features of interactive terminals (issuance of a "mark" of the appropriate length on the data line), was realized by making use of the original UL (Under Line) button of the VT 340 display. These hardware modifications did not affect the basic operation of the VT 340 display; only a few circuit boards had to be modified.

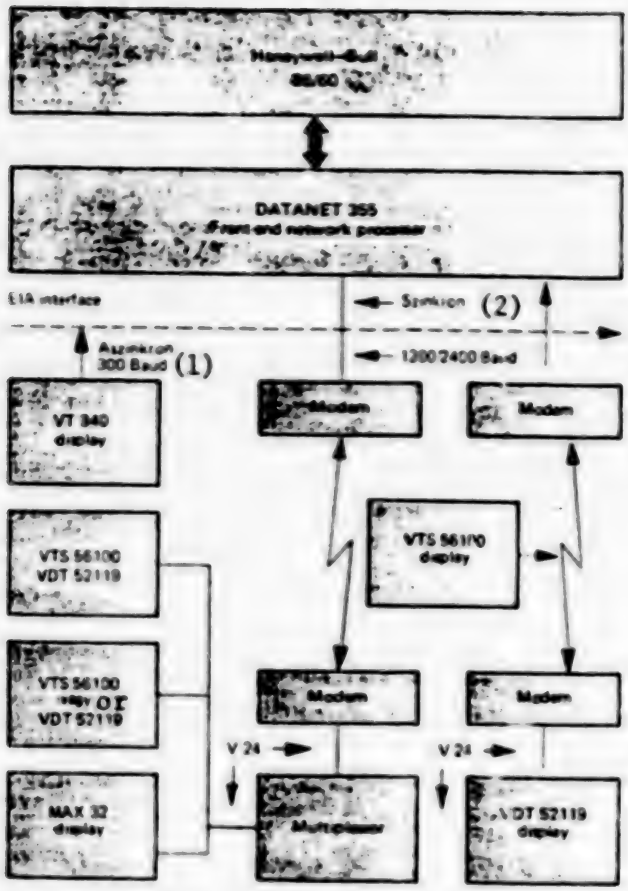
Interfacing the Synchronous Terminals (VTS 56100)

For those users who are located farther from the computer center, the VTS 56100 and VDT 52118/9 synchronous display terminals offer the possibility of connection to the system. The interfacing of the synchronous dialog-type terminals to the VIP 7700 (Video Information Processing) used in the Honeywell system is based on the latter's line algorithm. This line algorithm may provide not only point-to-point connection but also multipoint connection; thus, more than one terminals may be operated on a single line.

The possibility of interfacing the VTS 56100 display to the Honeywell system was provided by the Intel 8008 microprocessor built into the VTS 56100 display. Emulation of the original VIP 7700 terminal was achieved by rewriting the terminal-control program and minor hardware modifications.

Microprogram development was accomplished on the VTS 56100 terminal itself, with the aid of the ASM-B assembler for the Intel 8008, offered by VIDEOTON. The editing of the source-language punched on tape was accomplished also on the original VTS 56100 terminal. Injection and testing of the binary subject programs prepared in the course of translation was accomplished with the aid of the engineering console connected to the VTS 56100 display. The 4-Kbyte microprogram made in this manner can provide point-to-point or multipoint line connection to the Honeywell system at up to 2,400 Baud. The Type DZM-180 Polish-made matrix printer (hard copy) may also be connected to the terminal. Operating experience so far, after more than one year of service, indicated that the VTS 56100 terminals operate satisfactorily, establish reliable connections even via switched telephone networks. In the meantime, a new display family, the VDT (Videoton Data Terminal) was developed. Its members were also interfaced to the Honeywell system. During the first quarter of 1979 we completed the Honeywell-compatible VDT 52119 display terminal, which is comparable to the VTS 56100 display in terms of its line parameters.

We may make another mention of the VTS 56100 terminal in connection with the development of the VDT display program: The cross assembler running on the VTS 56100 terminal accomplished the translation of the source language for the microprocessor built into the VDT display. We tested the



Interfacing the VIDEOTON display terminals to the HB system

Key: 1. Asynchronous, 300 Baud
2. Synchronous

binary subject programs instead of a hardware device with the aid of a debugger burned into the VDT display.

The purpose of interfacing the VDT display family, featuring a more modern design, was not only to permit a cheaper terminal to be connected to the Honeywell system, but also to open up the possibility for further expansion of the peripheral complement.

Inexpensive and convenient off-line data preparation becomes possible with the aid of the dual minicartridge built into the VDT displays.

The basis of the interfacing of the display using the cartridge is also the line algorithm of the cassette display terminals, also of Honeywell design.

Development of the microprograms of the cassette-type VDT display is in progress. An interesting feature of the new Honeywell-compatible VDT 118 terminal is the fact that two Intel 8080 processors will operate in it at the same time: one performs solely the service for the cartridge; the other will perform the conventional display and terminal-control functions.

2542
CSO: 2502

DEVELOPMENT, OPERATIONAL RESULTS OF TELEPROCESSING SYSTEMS AND THE COMPUTER TECHNOLOGY COORDINATING INSTITUTE

Budapest INFORMACIO ELEKTRONIKA in Hungarian Vol 14 No 6, 1979 pp 320-325

[Article by Laszlo Golya, department head; Imre Margitics, department head; Pal Merenyi, Senior staff scientist; and Tamas Razga, department head, all at the SZKI (Computer Technology Coordinating Institute)]

[Text] This article offers a general review of the work being carried out at the SZKI in the field of data teleprocessing since 1972, encompassing the R-10, R-12, R-20, R-22, R-22, IBM 360, IBM 370, Siemens 4004, and Siemens 7000 systems. It describes the results achieved so far, including the microprocessor-based data-transmission control unit developed at the Institute, the interfacing of domestically manufactured terminals to IBM and Siemens equipment, the successful introduction of self-developed auxiliary equipment, and the development plans for the next five years. (Manuscript received 25 August 1979.)

Scientific research/development and design work is being carried out at the Computer Technology Coordinating Institute on the system-engineering aspects of data teleprocessing (TAF). In using the term "system engineering" we mean that we establish full TAF systems in the environment of various types of medium- and high-capacity computers under the following conditions:

- The hardware/software system of the central computer is left as it was originally provided by the manufacturer;
- System integration of series-manufactured terminals and line couplers, primarily those made in the MNK [Hungary];
- Applications contributing to the convenience of the operator and higher level of service;

- Preparation of documentation ensuring the proper operation of the system and its proper reproduction.

Our work covers the following systems:
- ESZR [Unified Computer System]: 1010, 1012, 1020, 1022, 1040
- IBM 360, 370
- Siemens 4004, 7000.

It is evident from the foregoing that the Institute has several goals in mind with the TAF development projects discusses in this article:

- To gain experience and knowledge capable of being utilized in other institutions concerning the construction and operation of the ESZR TAF system;
- To interface domestically made terminals and line couplers to computers widely used in Hungary—primarily of Western origin—so that the own needs are met and reduction of import volume may be accomplished in other institutions also,
- To gather software knowledge concerning the operation of installed TAF systems, which may find nationwide usage.

Below we briefly discuss our development projects related to the above systems and the experience we gained with the operation of the systems. The need of the ESZR users that their equipment, primarily the R-22 computers, be expanded by data teleprocessing capability became quite urgent from 1976 onward. As a result of a development project in our institute, we completed a microprocessor-based data-transmission control unit in 1977, which permitted the establishment of two test TAF systems.

1. We established a R-22/R-10 TAF system between two computer centers located approximately 30 km apart, using a two-wire leased line (see Fig. 1). In this system the R-10 basically operates in three modes under the supervision of the ESZ DOS POWER (BTAM).

   R-10 Data Collection and Checking

   The data arriving from modem-connected displays enter magnetic-disk files and thence magnetic tape for checking.

   RJE Operation

   The R-10 computer operates like a batch terminal. The jobs started from the card reader run on the R-22 under the supervision of the POWER RJE system, and the lists are fed to the printer of the R-10.

Data-Transmission Mode

R-10 console commands execute the data exchange between the two computers.
Files of either card or list format may be transmitted in either direction. The data traffic takes place according to the BSC algorithm at the rate of 1,200 bits per second.

2. R-22 computers with a main-memory capacity of 256 kbytes or more already permit the operation of the OS-CRJE system which enables dialog programming in the batch operating mode (see Fig. 2). CRJE operation started in the R-22 environment in 1977 with the aid of the microprocessor-based data-transmission control unit referred to earlier. Six ESZ 7168 terminals were connected to the central computer. From the terminal there are possibilities for job entry, syntactic and semantic injection, job-run starting, and library handling.

In its maximum configuration, the programmed data-transmission control unit is capable of serving four synchronous and 12 asynchronous terminals at rates ranging from 100 to 9,600 bits per second.

Utilizing the programmability of the control unit, we completed the interfacing of the following terminals so far: ESZ 7168, ESZ 8562, ESZ 8564, ESZ 8570, VTS 56100, and ESZ 1010.

The Siemens Subsystem (see Fig. 3)

Incorporation of domestically made devices in the Siemens TAF system started in 1972, by interfacing the domestically made VT 10010 minicomputer to the Siemens standard. The minicomputer operated as a remote Siemens batch station. In the course of the interfacing the TAF developers of the Institute gathered much useful and favorable experience concerning the interfacing of system-foreign terminals, and the methodology of the interfacing procedures were also elucidated.

To widen the choice, we decided to establish an interactive terminal connection also. By interfacing the ESZ 8570 we established an experimental connection which was operated—for demonstration purposes—between Budapest and Moscow too during the summer of 1974.

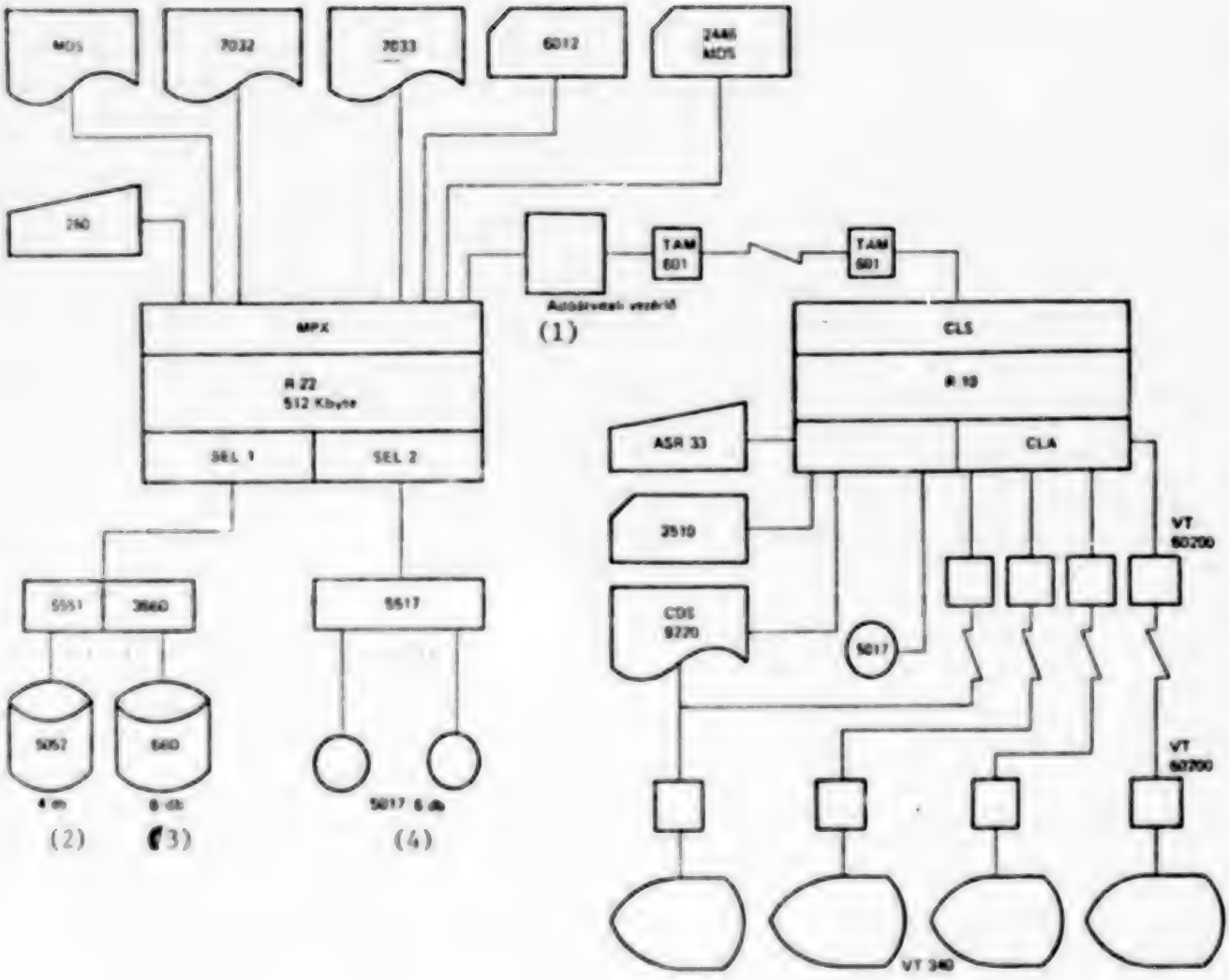


Fig. 1.

Key: 1. Data-transmission controller
2. Four units
3. Six units
4. Six 5017 units

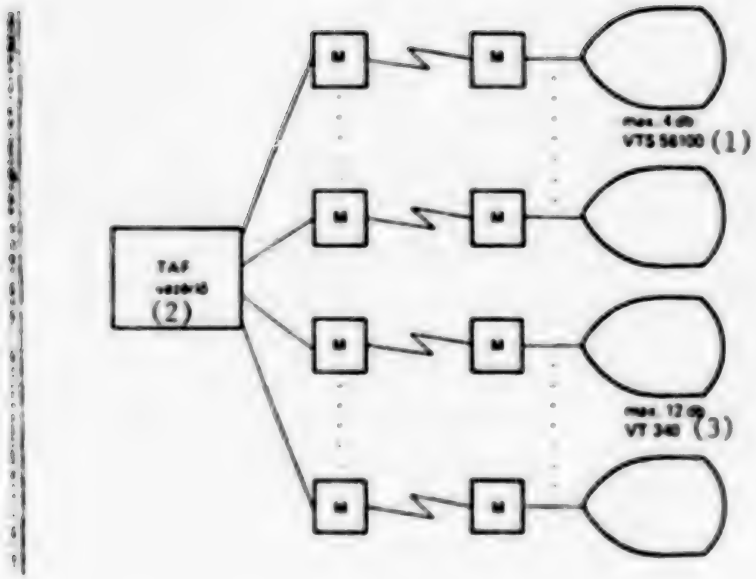


Fig. 2.
Key: 1. Up to four VTS 56100 units
2. TAF controller
3. Up to 12 VT 340 units

On the basis of the initial connections as well as the introduction of the TAF-oriented (interactive) time-sharing operating system, the BS-2000, we proceeded with the incorporation of other domestic terminals into the Siemens TAF system. Thus, simultaneously with the introduction of the operating system, ten ESZ 7168 (VT-340) terminals were operational in conjunction with the Siemens system. Starting from the favorable user experiences concerning the terminal system based on the VT-340, we formulated our strategy for terminal-system development on the basis of the following two major considerations:

- We tried to use such devices which are flexible enough so that they can match the foreign system as perfectly as possible, so that user inconveniences arising from the use of system-foreign terminals are reduced to the practicable minimum;

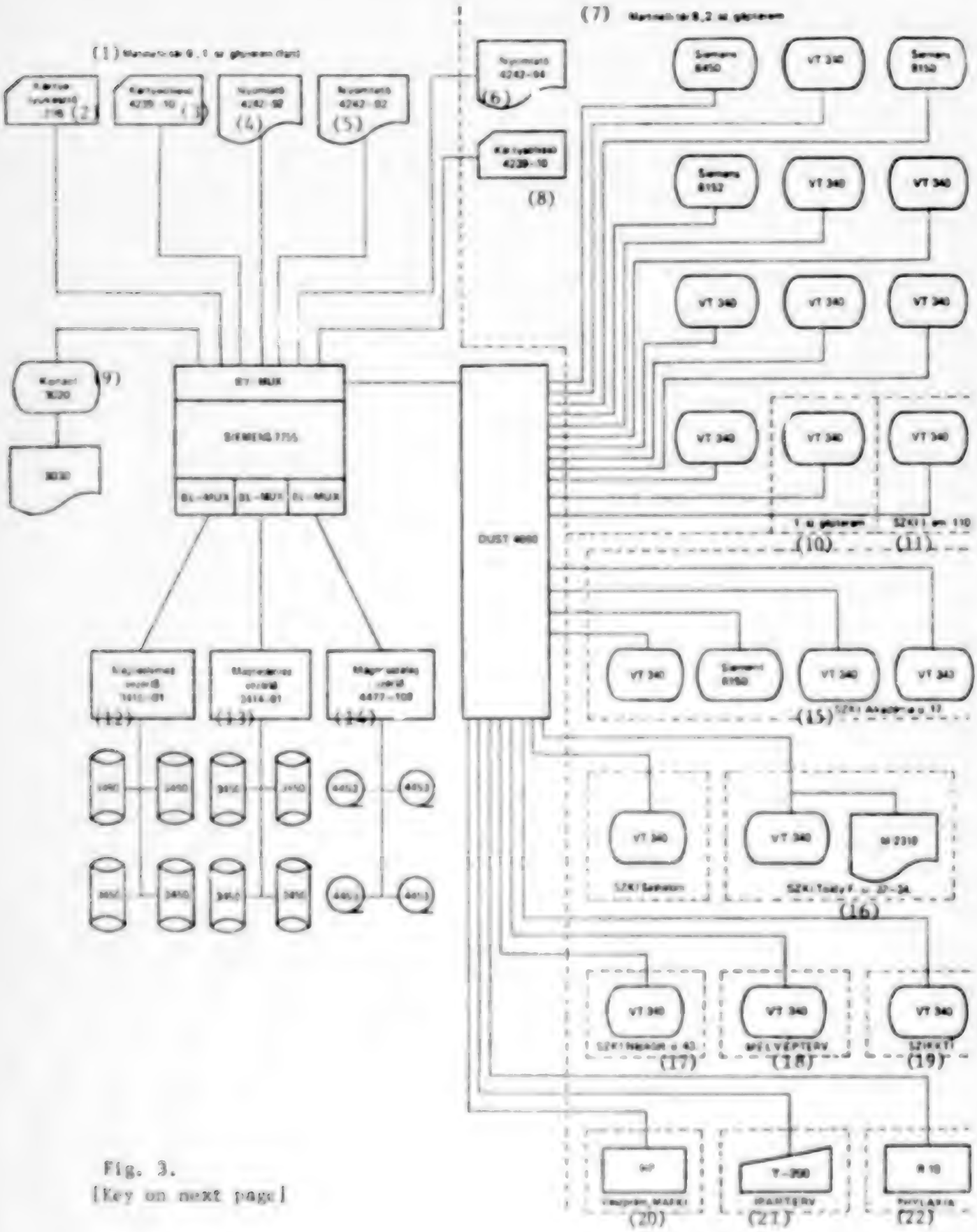


Fig. 3.
[Key on next page]

[Key for Fig. 3; preceding page]

1. Computer room at Martinelli Square No. 8, No. 1 (ground floor)
2. 2536 Card puncher
3. 4239-10 Card reader
4. 4242-92 Printer
5. 4242-92 Printer
6. 4242-92 Printer
7. Computer room at Martinelli Square No. 8, No. 2
8. 4239-10 Card reader
9. 3020 Console
10. Computer room No. 2
11. Computer Technology Coordinating Institute, 1st floor, No. 110
12. Magnetic-disk control 3416-01
13. Magnetic-disk control 3414-01
14. Magnetic-tape control 4477-108
15. Computer Technology Coordinating Institute, Akademia Street No. 17
16. Computer Technology Coordinating Institute, Foldy F. Street No. 32-34
17. Computer Technology Coordinating Institute, Nepkoztarsasag Street No. 43.
18. Civil Engineering Design Enterprise
19. Silicate Industry Central Research and Planning Institute
20. Hungarian Petroleum and Natural Gas Research Institute, Veszprem
21. Architectural Designing Enterprise for Industry and Agriculture
22. PHYLAXIA Vaccine and Inoculant Factory

- The devices used must have an intelligence which permits
  - a minimum local processing capability, as needed by the users;
  - a fault-diagnosis capability for increased reliability and easier troubleshooting (data-transmission monitoring).

Keeping the foregoing in mind, we decided on the then just developed, domestically made, programmable interactive microprocessor-based VTS 56100 terminal. The first target type emulated with the VTS 56100 from the Siemens terminal assortment was a higher-performance terminal, the TRANSDATA 8152. During the first interfacing we primarily attempted to try out the new technology, so the realized functions strictly matched the functions of the emulated terminal. This was followed by a floppy-disk terminal based on a member of the M05X microcomputer family, developed in our institute earlier. This also emulates the well-proven 8152, and has the following capabilities additional to those of the 8152:

- A local EDITOR of which the commands are compatible with the commands of the Siemens time-sharing EDITOR (of course, the command complement capable of being used from the terminal is only part of the full command complement of the Siemens);
- The work may be performed on several stations simultaneously (on-line transmission on one station, off-line editing on another station, or data collection or—as a special function—card control).

Increasing demands imposed on microprocessor-based terminals (for example expansion of the local periphery assortment with higher-performing background memories and simultaneous increase in the data-transmission rate) necessitated the use of the new, multiprocessor architecture in the TAF system built around the Siemens also. Accordingly, we included the biprocessor-type VDT 52100-based TRANSDATA 8161 terminal in the system.

The cost/performance ratio of this terminal category is such that it offers the possibility of economically emulating the entire Siemens terminal complement on the same hardware basis (it pays to emulate even the cheapest and simplest terminal type, yet it is also feasible to emulate the most complex terminal types).

This principle allows the establishment of a hardware-homogeneous terminal park with all benefits arising from easier serviceability and operating reliability. At the same time, the manifoldity of the terminal-park functions is retained for the users, so that all user needs can be met.

In addition to the development of interactive terminals (which have relatively smaller local processing capacity), we continue the development of a so-called heavy terminal based on the Hungarian-made small computer (ESZ 1010). In the course of this project we developed the VAMPIRE TAF frame system, operating under a RTDM FE monitor supplemented with a DTM. This permits connection to be maintained between the small computer and several processing units simultaneously, even if the units are of different types (for example point-to-point and multipoint), in an on-line manner (while emulating the terminal) with off-line background processing being carried out at the same time. In this manner we can make maximum use of the capabilities of the small computer.

The IBM Subsystem (see Fig. 4)

We installed the IBM 370/125 computer subsystem of the Institute in 1975. The present hardware/software configuration was built up gradually, as the needs arose. The following are its main characteristics:

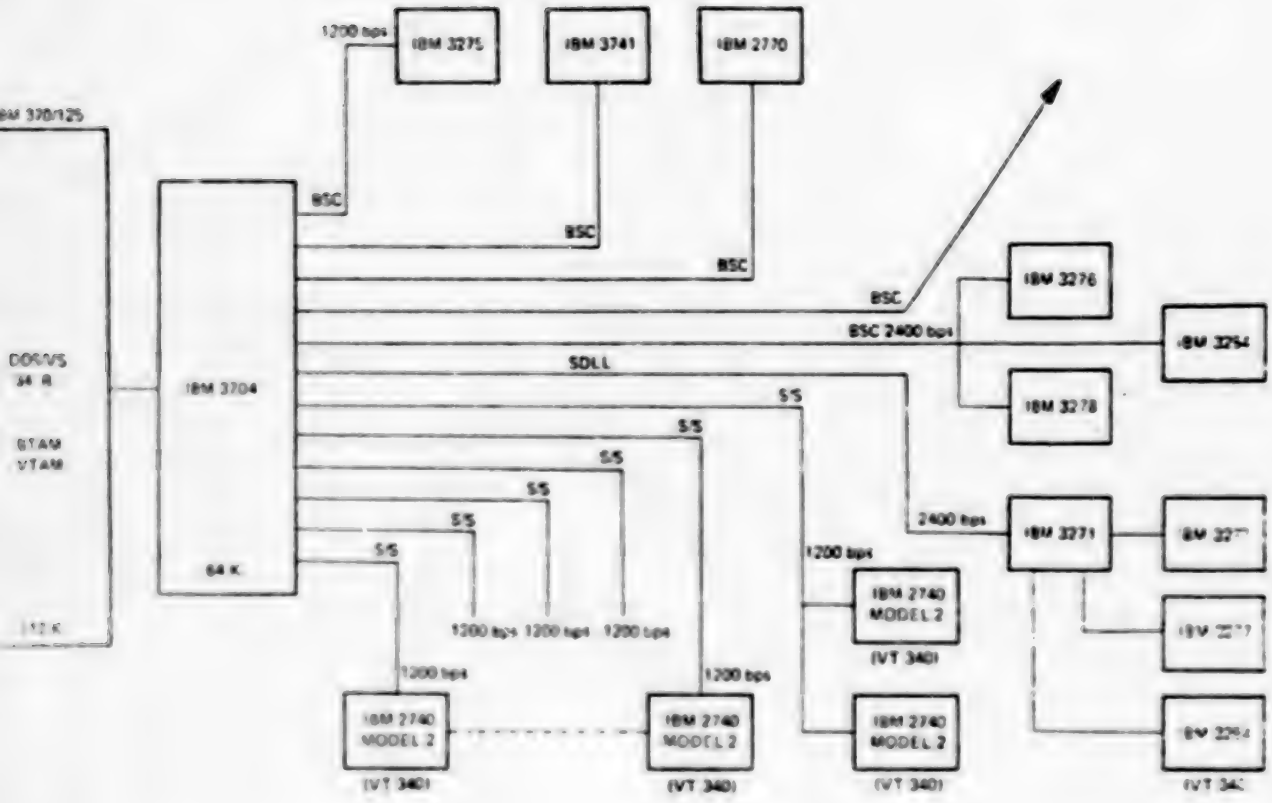


Fig. 4

1. Hardware

CPU

Computer type: IBM 370/125, Model 2
Operational memory: 512 kbytes
Background: Disk, 400 mbytes, Type: IBM 3330

Communication controller

Type: IBM 3704
Memory capacity: 64 kbytes
Channel adapter: TYPE1
Scanner type: TYPE2
Line sets: Three LINE-SET 1A units
Three LINE-SET 1D units

2. Software

CPU

Basic operating system:
- DOS/VS - R.34
- Five-partition configuration
- POWER/VS

Interactive processing:
- ETSS (presently)
- CICS (being installed)

TAF support:
- BTAM (presently)
- VTAM (being installed)

Communication controller

Basic software support: PEP (Partitioned Emulation Program)

The subsystem operates as a service facility in three shifts: during the daytime hours in the closed-shop mode and during the evening and night hours it may also operate in the open-shop mode.

Batch processing is carried out in the closed-shop mode in such a manner that the preparations of the jobs for running is accomplished during the same time by interactive processing from the terminals. The increasingly TAF-oriented subsystem has TAF-related components to a minor extent from IBM manufacture. An increasing percentage of the terminals are the results of our own development or adaptation.

We developed in our institute the IBM 2740 compatible version of the VT-340 terminals. As a result of minor modifications carried out in the operating software, we can now display Roman and Cyrillic characters, and we can also enter such characters. In many respects this represents an improvement in the original IBM version.

Our primary goal in creating the subsystem was to permit increased use of domestic and socialist terminals, and to expand the networks with domestic terminals. In addition to the above-mentioned IBM 2749 terminal, we also interfaced the VDDS (operating as the IBM 3275) and the VTS 56100 (operating as the IBM 2780 terminal).

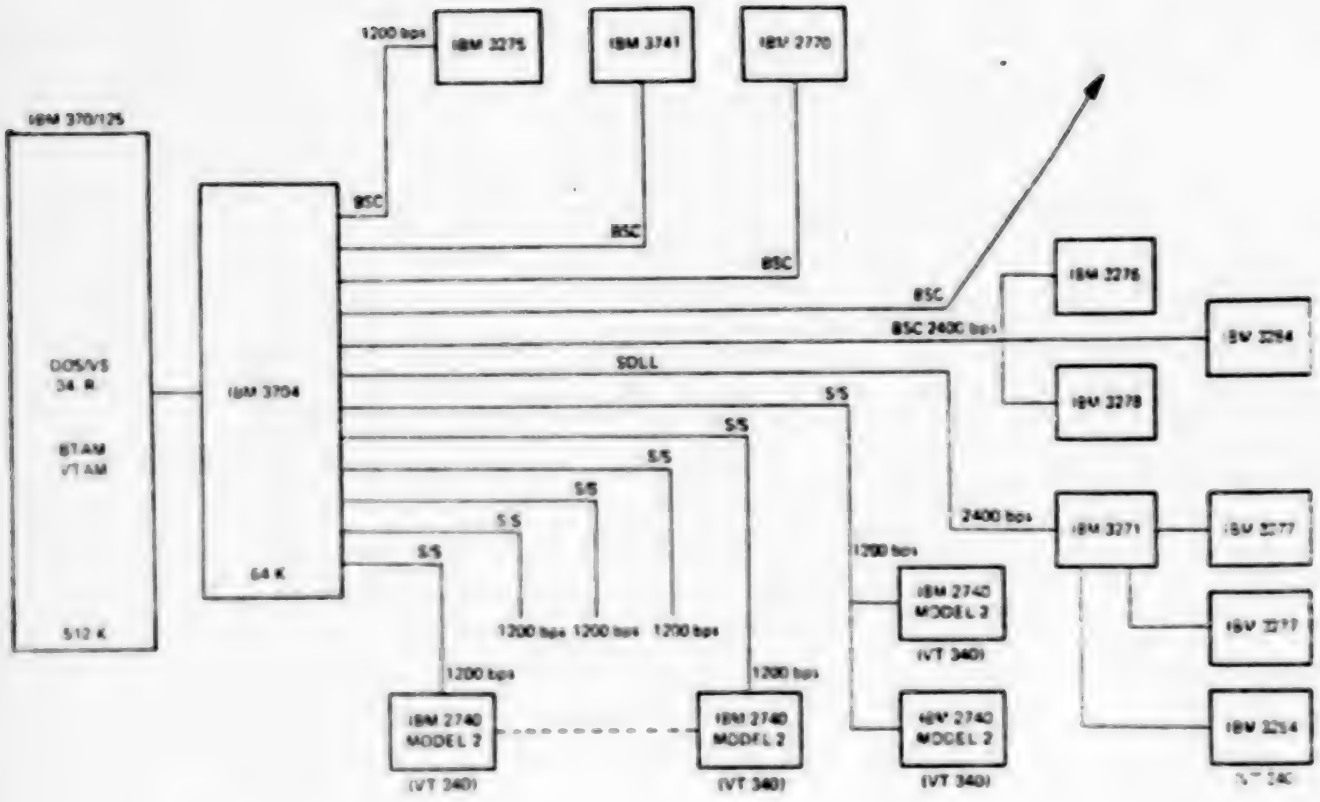


Fig. 4

Below we discuss some of the experiences we gained in our TAF developing and operating practice.

TAF system development, as any extensive and intensive engineering development system, requires specialized development aids. This is attested by the fact that the development aids we developed, and which are discussed below, can all be used effectively in our daily system operations.

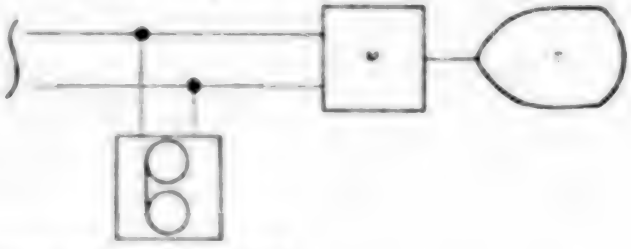
TAF Target Instrument With Magnetic Cassette

Measurement and troubleshooting of TAF devices consisting of computer, multiplexer, modem, telephone line, modem, and terminal, is always a very difficult task and generally requires cooperation of several specialists. We developed a special instrument to make this task easier; it uses a general-purpose tape recorder with cassette. Basically, the instrument features an interface at the recorder input which provides for the recording of the analog signals appearing on the data-transmission line on tape.

The TAF system may be examined in various ways with the aid of this relatively simple apparatus.

1. Terminal-Modem Testing

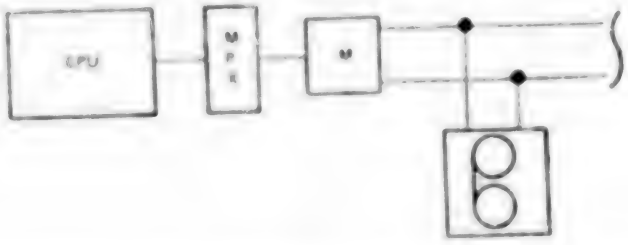
Transmission of a message sequence recorded on cassette earlier toward the terminal. By using this method, the terminal-modem assembly may be tested without a computer (line test). The same method also permits data collection from the terminal over a 1 to 1.5 hour period, after which the data may be entered in the computer via an on-line connection.



2. Multiplexer-Adapter Testing

A test program recorded on cassette may be run onto a selected adapter in such a manner that the computer TAF software sees a terminal on the line.

The advantage of the apparatus is that it is capable of being carried in a suitcase, is thus portable, and is inexpensive.



The SIAV3 Data-Transmission Follower (Monitoring) System

The SIAV3 monitor is a data-transmission follower system running on the base of the VTS 56100 microprocessor-equipped terminal; it follows synchronous point-to-point and multipoint line procedures. It is suitable for quick identification and elimination of faults and perturbances occurring in the data-transmission chain.

The monitor has two operating modes: the active and the passive operating mode.

In the active mode the monitor replaces an active element (terminal or large computer) of the data-transmission chain insofar as the line process is concerned, and "provokes" the incorrect sequences of the element suspected by test sequences.

In the passive mode the monitor, connected to an element of the data-transmission chain, "watches" the events taking place on the line and displays them on the monitor screen. The monitor may be connected directly to the line or to a data-transmission interface (V.24).

The monitor may write out the result either in coded form or directly in a hexadecimal form. It uses the USACII and EBCDIC code system, generally employed in data-transmission systems, and may be used in the conventional semiduplex or the full duplex operating mode.

Monitoring Programs

The advanced operating systems monitor and store the events of the full traffic taking place between the central system and the terminal in the TAF operating mode. By using an adequately intelligent program, these data may be interrogated from the system and printed out with a line printer. From the writeout it is possible to reconstruct the last transmitted signals over a defined data-transmission line before the connection was interrupted.

Development Plans

Among our plans for the next future there is the development of a TAF model system based on the R-60, with which we hope to integrate, operate, gain experience, and implement the integrated system of ESZ Type 8371 front-end processor and the current ESZ-OS. The project is expected to take 2-3 years and it is scheduled to start in 1980/1981.

Our further goal is the development of a network according to the principles of a heterogeneous (open) architecture so that it is combinable with other domestic networks. We are in the system-planning phase. Construction will start in 1980/1981 (until then we establish experimental connections). We expect the network to undergo testing in 1983/1984.

2542
CSO: 2502

THREE YEARS OF EXPERIENCE WITH THE TELEDATA PROCESSING SYSTEM OF RYAD

Budapest INFORMACIO ELEKTRONIKA in Hungarian Vol 14 No 6, 1979 pp 326-330

[Article by Peter Braun, deputy main department head; Gabor Horniak, Dr, department head; Levente Terenyi, senior staff member; and Odon Vid, department head; all at VEIKI (Research Institute of the Electric Power Industry)]

[Text] The TAF [data teleprocessing] system of the VEIKI has been described in several articles. This article discusses those results and experiences which were accumulated during actual operation. During the planning and trial operation of the system we attempted to consider many factors; however, we still encountered many unexpected situations and trends in actual use. These phenomena probably occur in other systems also; thus, we hope that our article would be useful to the planners and operators of these systems also.
(Manuscript received 18 August 1979.)

Introduction

The central computer of the system is an R-40 with a 1 mbyte central memory. Twenty terminals are connected to it via leased postal lines. The terminals operate under the NIMFORM interrogating system of our own development with the CRJE system. The group of users includes the trusts of the NIM [Ministry of Heavy Industry], the designing institute of the electric power industry, some large enterprises, and the departments of the VEIKI involved in computer technology. The users may obtain a departmental data base which is actualized twice a day with the aid of the interrogating system. The CRJE system allows the remote entry, upgrading, and interrogation of programs and data. The central computer operates with the OS MVT system.

Operating Experiences With the System Hardware

We started up the system with four lines, using VT 340 alphanumeric screen terminals and VTS 56100 terminals. One of the first problems encountered actually developed as a result of the use of two different types of device. The VT 340 screen terminal is not programmable; thus, it is not capable of playing the line algorithm of the AP-70 terminal used as the basis in the system. As a result, the program of the multiplexer handles it differently also. However, one thing had to be retained even with screen terminal type, namely the ETX (End of Text) character. In the course of the trials it became evident that this character does not pass through the modems since the modem-connecting cards include it in their operation.

This problem could be circumvented in two ways:

- By the selection of another control character than the ETX;
- By using three-wire connection without modem (since the distances involved are short), meaning the return of the interface signals within the connector.

We selected the second approach since this permitted better operation of the VT 340 screen terminals (transmission/reception in the OFF-LINE mode of the screen). It is true, however, that this operation turned out to be less than ideal for the circuits of the modem-coupling interface (SN 75150 and SN 751.54) since a circuit occasionally failed.It became evident over the years of operation that this happened only in one of our four connections. Accordingly, we do not plan to implement any change in these connections in the near future.

The startup of the 56100 devices was not without some problems either; here, we encountered regularly occurring faults as the modem directions were changed.Circuit modifications in the VT modems remedied this. It became evident later that this is required only in two-wire operation; the modems operate satisfactorily if we use a four-wire connection.

Once the system was operational, it expanded relatively fast, and an increasing number of terminals was added. This in turn caused extra loading of the multiplexer, which created further problems. Occasional faults were observed in the transmission between the CCA and the multiplex channel.

Other than their randomness, the faults had only one thing in common: the channel handled them as interface faults.

Much effort was exerted by staff members of the VEIKI and the CCA's designers at VT [expansion unknown]. Programs were prepared for the artificial generation of the faults and the freezing of the faulty state of the circuits. By means of the latter we identified the phenomena regarded as interface faults: In the logic "1" state of the STA-IN line the signals disappeared from the BUS-IN line, so that the channel sensed a parity-faulty status bit. In this manner we localized a fault in the microprogram of the CCA. Once this was taken care of, the system operated much more reliably.

A new task developed as the demands on the system grew: we had to install more and more terminals, while at the same time we were unable to increase the number of the lines.

Within a given building we solved this problem by establishing a multipoint network ("Realization of Multipoint Hardware Within the NIM"; VEIKI, Budapest, June 1977). The VIDEOTON Computer Engineering Factory loaned us the distributing amplifier required for the establishment of the network for the trial period; in the meantime we ordered an LTT TRADAN 4100 model, which the Postal Service has approved. At the present time we operate five VTS 56100 asynchronous terminals in the multipoint mode over a four-wire system; according to our measurements the increase in the response time is negligible even compared to the monopoint operation mode.

While we established the multipoint system, we examined the speed situation of the system and the various transmission times. We found the following in these examinations: The information system's various tables are issued relatively quickly—within one minute after the query was made—by the large computer when we operate in the interrogation mode. The display time of the table—depending on its data density—is 6-10 seconds on the VT 340 screen terminal and 15-40 seconds on the VTS 56100 terminal. Subsequent analysis indicated that the significant difference is the result of the use of the given line algorithm and also of the semiduplex mode of operation. According to the line algorithm, the transmission of a single data block always involves more message exchanges between the multiplexer and the terminal (callup, addressing, acknowledgments, and so forth), while the direction changes (turnovers) require relatively long time for the modems. According to our calculations and measurements, these represent approximately 50 percent of the full display time for a given screen.

In the CRJE operating mode the importance of this factor is not as much pronounced since there the messages to be displayed are, as a rule, smaller than the screen area while the response time is considerably affected by the loading of the large computer and the momentary state of the system.

The data-transmission lines must often also be used for speech operation. A very suitable device for this is the inductor-type System LB telephone device, if we could only purchase it. We were unable to accomplish this; therefore, we sought another solution. Ultimately we decided upon the MOHA 96 type data-transmission calling/speaking device from ORION.

Unfortunately we could not fully utilize the capabilities of this very useful and ingenious device while at the same time our system imposed a demand on it which it was unable to fulfill. According to the original design, the MOHA 96 had to be connected with both the modem and the terminal system (terminal plus multiplexer) via the V. 24 interface. However, the VTS 56100 does not have an external V. 24 connecting capability, and the connection of the modem inside the device is at the TTL level. For this reason we modified the circuitry of the MOHA 96 and dispensed with the V.24 connection. As a result, we had to give up the possibility of signaling during operation, so that the device could only be used alternately with the transmission operation.

The radial character of our system is responsible for the fact that the needs could not be met with the MOHA 96. For us it would be desirable if a device could be installed in the center and in each individual terminal. However, we actually must install one at each end of the connections, and as many in the center as there are connections where it is used.Problems result in placement, and in case one rings of the many, we have to find out which is the one.Although there is simultaneous lighting of a lamp when the bell rings (flashing), the bulbs are short-lived and they are inconvenient to replace.

Let us now quote some statistical data for the events of last year (between 1 May 1978 and 30 April 1979).

We classified the malfunctions in two main categories. The first category includes those malfunctions which temporarily paralyzed the entire system and principally occurred in the transmission between the multiplexer and the multiplex channel of the large computer. These were randomly occurring but systematic faults, which were not followed by troubleshooting and repair; we merely restarted the system. There were 114 such system shutdowns

during the period. They occurred as follows before and after th above-mentioned modification of the CCA microprogram (which was made earl) in December 1978):

87 events between 1 May and 30 November (seven months);
27 events between 1 December and 30 April (five months).

There was a major improvement in the situation; however, the situation is still not adequately favorable. In addition to the above there were two "true" hardware faults during the year in the multiplexer, requiring engineering intervention.

The other major category included faults concerning only individual users; the faults are distributed among the individual components of the connection.We list these faults without detailed description and commentary; we merely mention the components involved and the number of the events:

CLA - 4
VT 340 - 2
VTS 56100 basic unit - 2
Line fault 2.

All these were true malfunctions, and we established the cause of each. Repairs restored the functionality of the connection.

Operation of the System on the Large-Computer Side

Before starting the TAF system for actual operation the computer center operated in the classic bundled, multiprogrammed mode; and its operational order and operators were adapted to this. After the TAF system started, the character of the loading of the computer underwent a change. Insofar as operation is concerned, the special feature of the TAF system is that the jobs are in the memory for a long time.

In the OS MVT operating system the start of the TAF systems should be accomplished only under defined operating conditions for this reason. The memory-management strategy of the MVT forces the operator to place the tasks with very long running time in the upper addresses of the dynamic sector (see Fig. 1). This solution eliminates the long-term fragmentation of the dynamic sector, which prevents the running of jobs requiring much memory space.However, in order to achieve this state we can start tasks with long running time only if there are no running jobs. This means that the TAF system can be directly started only after IPL or we must wait

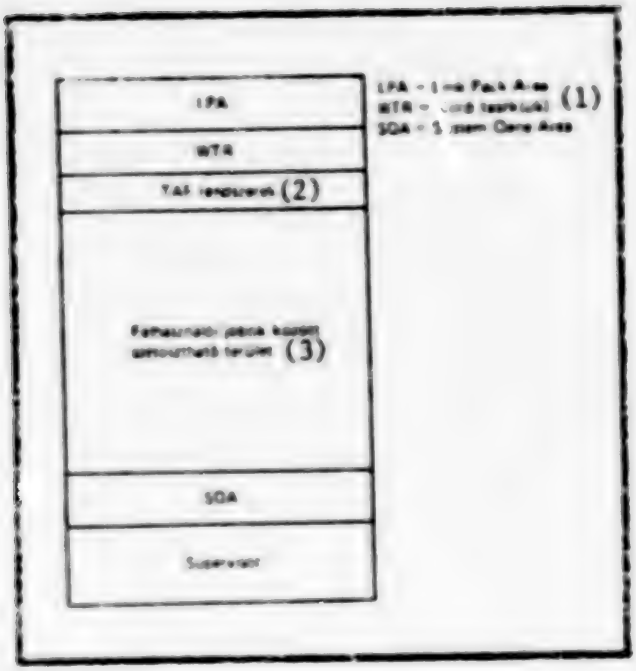


Fig. 1. Desirable memory structure in the OS MVT
Key: 1. WTR = Writeout task(s)
2. TAF systems
3. Area available for distribution among the user jobs

until the user jobs just running are finished, and no other job starts in the meantime.

The special feature of the TAF system created in the VEIKI is that the same terminal network is used simultaneously by two independent systems with different goal . The problem that each individual terminal is accessible only to one system at a time must be solved at the operator level. Failure to ensure this will cause the data pertaining to the different systems to become mixed up. This requirement can be met only by starting of the individual systems according to a specific sequence, and by appropriate control of the common lines during start and stop. This factor—plus the needs for task placement—means that starting the TAF systems is time-consuming. This is particularly bothersome if the systems must be shut down temporarily and then restarted.

We should devote some space to discuss the connection between the CRJE and the batch operation. The programmer operating the terminal regards the system effective if

- his commands are executed by the CRJE in short time (a few seconds);
- the jobs intended for batch running are completed within 1-2 hours.

Both expectations create a major task for the system. We may take appropriate measures during system designing to achieve fast response. If, for example, the configuration allows this, it is advisable to place the stations directly handled by the CRJE on a device on a little-loaded channel, so that some increase in the speeds of the various functions becomes possible. In that stage of CRJE operation where many programmers work it is advisable to reduce the batch loading (starting fewer initiators in the MVT) to ensure that there is sufficient space for the read-in task (CRJE RDR) started with the SUBMIT command. If, for some reason, the execution of some SUBMIT commands is delayed (for example if there is no space for the RDR start), the CRJE suspends all its other functions. This creates an uncertainty among the operators of the terminals located remotely from the computer since they cannot decide whether the terminal waits for an event or whether the operation of the system has ended. They try to resolve the uncertainty by telephoning, and this understandably imposes a greater strain on the operators.

Another critical point of the CRJE system is the run-through time of the jobs entered for batch processing. Obviously, if there are many programmers, there are more jobs, and everybody wishes that his programs are run in minimum time. However, the configuration provides many restricting factors:

- With a 1 Mbyte central memory, there is a memory space of 600-650 K available for the batch jobs during the CRJE's operating time, and this restricts the number and size of the programs which can be run simultaneously.
- The number of peripheral units available affects the run-through time in a complex manner: in conventional batch jobs the operator can organize the jobs according to their need for peripheral units, so that this represents a means for reducing the waiting time. This choice is not available in case of jobs coming from the CRJE; thus, the waiting time of the system increases significantly because of the randomness of the periphery need. As a result, the run-through time is considerably extended.

- The run-through time of the CRJE jobs is further lengthened by the fact that there is a need for running the batch jobs that arrive conventionally even during the CRJE time.

On the basis of the above considerations we had to devise an operating strategy which ensures that overall the CRJE users obtain shorter run-through times. This can be accomplished only if we make compromises, under the following conditions:

- We assign priority to program-injection tasks requiring little memory capacity, to cause these to be completed sooner;
- We must suppress those jobs which require much memory capacity, run for longer periods, or use more peripheral units, during the main time.

We took due account of the fact that the CRJE is used primarily for support of program-development projects, and that we regard it primarily as an aid for such projects.

In the operation of the interrogating system we must ensure quick response; thus, we must assure immediate access for these files while the interrogating mode is in effect (in the first shift).

However, in order to create a system that satisfies many users and has a short response time—the CRJE—we require a magnetic-disk capacity which ensures that all user libraries and smaller data files are immediately accessible. This may amount to as much as 5-20 Mbytes per user; so far we are not in a position to provide this. We solved the problem by

- ensuring that the interrogating system operates continuously;
- providing relatively small disk surface areas to the users on a continuous basis;
- meeting the needs for more disk surface area and magnetic tape by disk and tape replacement.

We use the high-capacity (29 Mbyte) disk units for storing the information that is continuously needed, for the interrogating system, and the limited areas of the users; the 7.25 Mbyte disks are used for the data files of the users. The large disks are not replaced; the small disks are continuously replaced to meet the joint needs of the TAF and bundled processing. The contemplated expansion of the disk-unit complement will provide major improvement in the situation.

Some Features of the Operation of the TAF System

The operation outlined above has some special features for the operating personnel and for the users which differ from bundled processing. Because of the continuous live connection with the users, a different kind of operational (operator) discipline is needed. Start of the programs in the system is random-like; during operation the users ask for and obtain information on their terminals. We have observed that for those sitting in front of the terminals the slower continuous operation is more preferred than operation with perhaps shorter response times but interrupted for relatively long periods during which no information is available.

In the course of the direct operation of the computer, there is sometimes a need for quick intervention. The central memory management and the periphery assignments must be "matched" to the loading of the network "at once" to ensure that the waiting time at the terminals is reduced as much as possible.

The operating system provides information about the status of the network via the console typewriter; however, rapid information may also be gathered from the modem displays. The VIDEOTON modems used have pilot lamps to indicate transmission and readiness. The device shows whether the given terminal is operational, and the data-transmission rate can also be ascertained.

We estimate that the dispatcher telephone traffic increased by approximately 50 percent while the data-transmission system is in operation. The extra amount is created by activation questions, enquiries, and information pertaining about the completed material.

The attitude of the users has also changed. The convenience of the program test on the terminals and the short response time causes the programmers to restart the improved programs at once, so that the advance checking which is a routine in bundled processing, and which then gives better entry, is dispensed with. As a result of this kind of work, the programs are made faster but with more testing. Since the human resources represent the bottlenecks now in computer centers, the effects of the TAF system are beneficial. The CRJE system permits only a single interrogation of the results of the program runs. Thereafter, according to the output conventions, the results are erased. However, there is a need for multiple interrogation of the results, partly to ensure protection of the results and partly because there are results which are handled by more than one user. We had to devise

a new output section for this reason, from which the results are erased only after a specific number of interrogations or after a relatively long period of time. This auxiliary system operates automatically and requires no maintenance.

Much concern was caused by the need for developing a reliable saving system for user and system libraries. In case of a hardware or software fault which causes system failure, damage may occur not only to the 3-5 programs which happen to be running on the computer serving the TAF network but also to the libraries of the active users. Such system failures, requiring engineering intervention, occur about weekly in good times and as much as daily in particularly bad times.

The burden of saving and restoring the CRJE libraries must be borne by the computer center. The users do not want to, and cannot, perform this task. The saving system must also ensure continuous operation. Outage lasting for several days resulting from library damage occurred only once over the years of operation. But it requires much effort to manage the libraries and to make available the required replacement libraries.

The library-saving and -restoring systems—which feature high-speed operation and special configuration—work at daily and weekly cycle.

Loading and Accounting

Figure 2 shows the loading of the system during a "typical" workday. It can be seen that the system has low, pulsed loading. The editorial functions of the CRJE system follow the daily routine of work; the offered jobs substantially shift the system loading.

The nocturnal increase of the bundled processing results from the running of the tasks held back during the daytime. The TAF system is in operation between 9:00 AM and 20-22:00 PM. The shutdown time depends on the work on hand. Generally, the system shuts down after the last user has reported out.

The response time to the entered programs is between a few minutes and a fre hours, depending on the size of the program and the loading of the system. The response time of the editorial work varies between a few seconds and a few minutes. With one reporting-in, the users spend 10-40 minutes before the terminal, on the average.

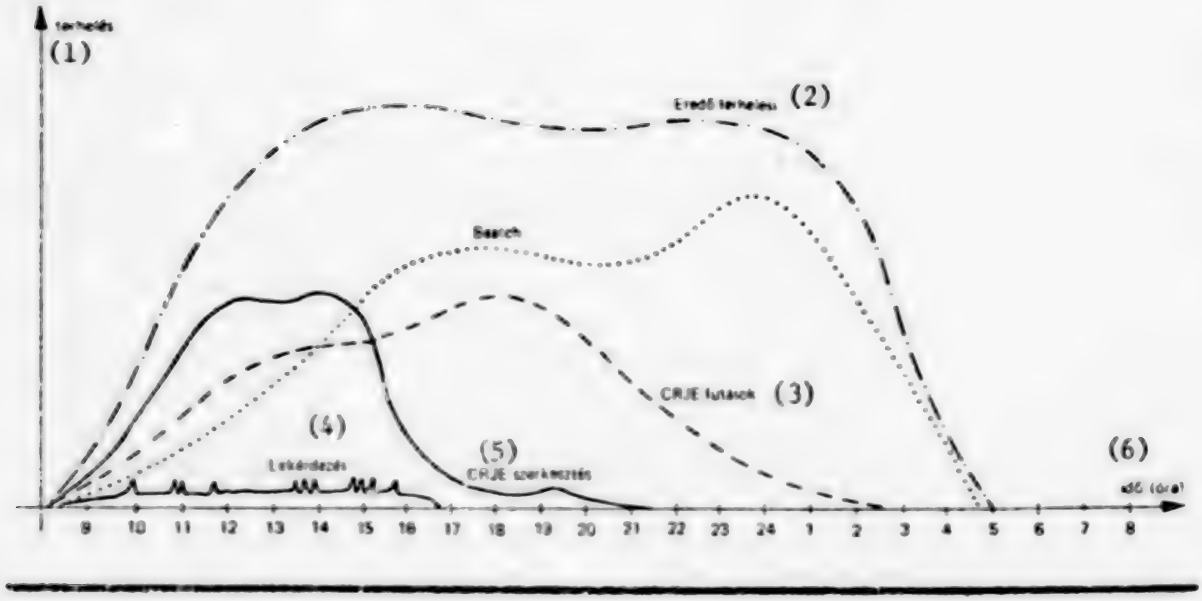


Fig. 2. Loading of the system at a typical workday

Key: 1. Loading
2. Resultant loading
3. CRJE runs
4. Interrogation
5. CRJE editing
6. (Clock) time

Computerized accounting is by a system that shows the fact that the job in question originated from the terminal. This is useful both for handling complaints and for monitoring computer loading. In recent times the tasks issued via the terminal network represented approximately 40 percent of the computer loading. The accounting system does not charge for editorial operations; this was decided to promote the use of the terminal system. The fees for the started jobs are the same as the price that would accrue if the jobs would have been started in bundled processing.

We found that the initial problems of the system and the minor problems still plagueing it performs efficiently for the users, and contributes to the fact that they can solve their problems faster and more conveniently. Thus, it represents a major step forward in computer-technology applications.

2542
CSO: 2502

REDUCTION OF LOSSES FROM VIRAL DISEASES AMONG CALVES ON LARGE-SCALE FARMS. I. POSSIBILITIES OF ACTIVE IMMUNIZATION AGAINST VIRAL RESPIRATORY AND ENTERIC DISEASES OF NEWBORN AND YOUNG CALVES

Budapest MAGYAR ALLATORVOSOK LAPJA in Hungarian Vol 34 No 11, Nov 79 pp 729-734 manuscript received 18 May 79

KUDRON, Endre, Dr; Animal Health Institute of Szombathely

[Abstract] Results of a study on optimal timing of immunization of pregnant cows as well as newborn and young calves carried out at a state farm are reported. From the stock which had been on a schedule of continuous vaccination, some pregnant cows were selected at random which delivered 5 heifers and 5 bulls. The blood of the cows taken before vaccination, at calving time, their colostrum as well as the precolostral blood samples of their calves and subsequent samples taken at 2 week intervals up to 6 months were tested for the presence of virus neutralizing antibodies. The following conclusions were made: Adequate antibody response was induced in cows by a single VEDEVAC vaccination. Calves should receive a single prophylactic vaccination with VEDEVAC to prevent an eventual VD-virus infection during their growth stage. Two vaccinations with inactivated IBR gave adequate antibody response but are justified only in stocks where such an infection is present. Vaccination of calves twice with adenovirus vaccine insured an adequate level and duration of active immunization. Its advantages include the longer persistence of antibodies and sufficient protection remaining from the prophylactic, basic immunity to decrease the severity of adenovirus infections in the calf stables. In connection with the active immunization of the newborn it is stressed that it does not absolve from the timely administration of sufficient amounts of colostrum. This remains very important in preventing other viral and bacterial diseases and in increasing the general resistance of the calves. The following preventive vaccination schedule is recommended for large-scale cattle farms:

1. A single dose of VIDEVAC vaccine for pregnant cows in the 8th month;
2. Two doses of adenovirus vaccine at 5-7 and 30 days, and a single dose of VEDEVAC vaccine at 60 days of age for all calves;
3. Two vaccinations with inactivated IBR vaccine for bull calves at 30 and 60 days of age. References 50: 9 Hungarian, 1 East German, 40 Western.

2473
CSO: 2502

REDUCTION OF LOSSES FROM VIRAL DISEASES AMONG CALVES ON LARGE-SCALE FARMS. II. USE OF A SPECIFIC PREVENTIVE VACCINATION PROGRAM AND RESULTS AT TWO TYPES OF LARGE-SCALE FARMS

Budapest MAGYAR ALLATORVOSOK LAPJA in Hungarian Vol 34 No 11, Nov 79 pp 735-741 manuscript received 18 May 79

KUDRON, Endre, Dr, SZALAY, Denes, Csaba, Dr. SZABO, Laszlo, Dr, LUNG, Jozsef, Dr and VARGA, Janos, Dr; Animal Health Institute of Szombathely, Vas Megye Animal Health Station, and Gyor-Sopron Megye Animal Health Station

[Abstract] Data on the effectiveness of 2-3 years of continuous vaccination of cattle at two types of large-scale agricultural establishments (a state farm and a farmers' cooperative) are evaluated. The measures were necessitated by the great losses caused by adeno- VD- and IBR-virus infections. These were in part due to the inadequate quarantine and environmental conditions present at the newly established farms. In response to the vaccination program and suitable environmental changes, there was a nearly 50 percent decrease in losses (deaths and emergency slaughters) from 30.9 percent to 16.7 percent at the state farm and from 19.6 to 8.3 percent at the farmers' cooperative. There was also a simultaneous decrease in the incidence of the diseases. It is stressed that specific vaccination against viral respiratory and enteric diseases is only part of the solution. Prevention would be even more effective if the large-scale farms would first improve their environmental conditions and would employ the preventive vaccination program only where and when it really became necessary. This approach would simplify the animal hygienic work on large-scale farms and would improve the increasingly difficult diagnostic problems currently associated with these viral diseases. References 30: all Hungarian.

2473
CSO: 2502

EPIZOOTIOLOGY OF STAPHYLOCOCCOSIS OF POULTRY

Budapest MAGYAR ALLATORVOSOK LAPJA in Hungarian Vol 34 No 11, Nov 79 pp 751-753 manuscript received 14 Dec 77

ELIAS, Bela, Dr, assoc, prof., candidate of veterinary sciences, TURY (Mrs), ILLES, Erzsebet, Dr; Veterinary Medical University, Department of Epizootiology, and National Animal Health Institute

[Abstract] Statistics show that losses among domestic fowl, caused by staphylococcus, have been on the increase in recent years. The epizootiology of a Staph. aureus infection involving young fowl at a large-scale fowl farm has been studied and is reported because of its unusual clinical manifestations and differential diagnostic considerations. The results of clinical, pathological, pathohistological and bacteriological studies confirmed that the septicemic form of the disease can be present in young, growing animals as well, when the lameness of the animals is not accompanied by visible changes in the joints. The isolated strains belonged to the human subspecies. Thereby, the disease was classified among those where the possibility of cross infections must be considered. Since routine diagnosis does not involve determination of the subspecies, the frequency of human sources of infection can not be estimated. References 8: 2 East German, 2 Hungarian, 4 Western.

2473
CSO: 2502

UDC: 621.396.669.001.4-758.37:511.7

INVESTIGATION OF THE EFFECTIVENESS OF ELECTROMAGNETIC AND MAGNETIC SHIELDING BY APPROXIMATIVE CALCULATION

Budapest ELEKTROTECHNIKA in Hungarian Vol 72 No 2, Feb 79 pp 41-51; manuscript received Feb 1979

KERENYI, DENES, Graduate electrical engineer, Candidate in Technical sciences, Head of the structural laboratory of Ganz Electrical Works, Budapest.

[Abstract] Transformer losses may be reduced by installing an aluminum or copper panel over the inside wall of the housing where scattered flux has the greatest effect (electromagnetic shielding) or by using a magnetic shunt assembled from transformer plates having high magnetic conductivity (magnetic shielding). Studies were conducted in order to compare the effectiveness of these two types of shielding, to evaluate the factors affecting their effectiveness, and to determine the use areas of the two approaches. The study was conducted with the aid of an approximative calculation method applied to a specific device. Starting with the Maxwell equations and introducing a number of approximation conditions, the authors developed simple expressions for the characterization of the losses. The method is more accurate than that based on a model which considers the magnetic field as being a system of finite magnetic impedances. Data obtained with the aid of the method described were compared with data obtained in measurements. Satisfactory agreement was found; thus the method was also judged suitable for practical purposes. Figures 11; references 10: 1 German; 3 Hungarian; 2 Czechoslovak; and 4 Western.

2542
CSO: 2502

PROGRESS IN CRYOELECTROTECHNOLOGY HAILED

Bucharest FLACARA in Romanian 25 Nov 79 p 23

[Interview of university professor and engineer Dr Silviu Puscasu, chief of the Electrotechnology Department of the University of Craiova, active member of the CEMA Intercryleg Group, dean of the Craiova Cultural-Scientific University, member of the Romanian National Committee for CIE, the author of more than 80 articles and studies published in specialized reviews, as well as certain scientific works at the Strasbourg and Bruxelles Congresses, by Mihai Stanescu: "Romanian Cryoelectrotechnology - An Assurance for and a Condition of Technical Progress"]

[Question] Esteemed comrade professor, I somewhat understand your work in the use of electrotechnology at very low temperatures, of cryoelectrotechnology, for energy purposes. It is a field of great perspective in contemporary science and technology. How did you come to work in this field?

[Answer] By following a long and difficult path, beginning in my second year of high school when my late physics professor Constantin Gh. Bradeteanu, a renown author and experimenter, instilled a true passion for physics in me. Because of him, I had begun to formulate a real picture of the energy reserves of mankind, without knowing at that time and at that age the future of the next 30 years. However, remember that in 1938-1939, in one of the articles appearing in the newspaper STIINTELOR SI CALATORIILOR, the predecessor to today's magazine STIINTA SI TEHNICA, it was noted that the sun and cold (approaching a temperature of absolute zero) will have a major say with regards to the future of energy.

[Question] It was a realistic, very interesting look forward.

[Answer] A more than visionary idea for those times. Regarding the sun, we knew even then much more concerning its energy value than about the ways in which cold could bring about important solutions for energy in the future. Academician Corneliu Miklosy, professor

engineer Dr docent Plautius Andronescu, academician Remus Radulet and others stressed many times in their very interesting university lectures the energy aspects of the phenomena before us and brought about among the students a spirit for their courageous and insistent study of the subject. As true scientists, even at that time and in the most serious manner, they were thinking about the limits of energy sources and were trying hard to instill in their disciples the passion for research in an unexpectedly important field. At that time, Romania had only about 500-700 MW of electrical power, something less than three-fourths of the current power at the Isalnita Thermo-Central in Craiova. I was part of the generation that began to update technology at the time of the first plan to electrify the country.

[Question] When did you definitely get involved in cryoelectro-technology?

[Answer] In 1970-1971, having had a series of articles and studies that appeared in prestigious magazines fall into my falls, I realized the exceptional importance of using superconductibility in conserving electrical energy and raw materials. Back in 1911, the Dutch physicist Kammerlingh Onnes had discovered that a certain type of conducter (mercury in his case) at very low temperatures completely loses its resistance, becoming a superconducter. This means, and he said so, that we can make a current of thousands of amperes flow through an extremely thin wire. Certainly, other materials and especially alloys with superconducter properties and remarkable technical-economic properties were also discovered. Thus, simplfying things: superconducters can handle a much greater current than can a classical conducter in the same wire section. I started from this point.

[Question] And with this the path toward application was opened.

[Answer] Not at all! Up until 1965-1970, hardly anyone in Romania was interested or paid much attention to certain technical energy applications using the phenomenon of superconductivity, especially since two very complicated and, at that time, very expensive technologies were involved: making superconducters and the cryogenic fluid. Nonetheless, some prestigious research institutes and laboratories had succeeded, even during the 1963 to 1972 period, in obtaining several promising results - let me note one area - in the field of building some operating models of cryo-turbogenerators using superconducters, giving net advantages compared to the classical ones.

[Question] This was done in spite of the fact that specialized magazines and, generally, technical literature have contained and still contain today certain opinions to the contrary.

[Answer] It is good that they appear. A difference of opinion and ideas is always welcomed. At one time it was stated that the usability of cryomachinery would only occur from 3,000 MW on up, per machine. Today, due to the rapid progress made in the top technologies involved in cryoelectrotechnology, the power limit has become 600 MW! I understood that we do not have to wait until others are ready to offer us extreme costly licenses. Therefore, a beginning must be made in the field of using cryoelectrotechnology for energy purposes right here in our country.

[Question] According to what I know, the ice was broken here in Romania in 1973.

[Answer] In principle, one can say that, yes. Cryogenic work and technology is appearing and taking on scope at the University of Cluj, at the Timisoara Polytechnical Institute, at the Bucharest Research and Design Institute for the Electrotechnical Industry and at the current National Center for Physics, but this does not strictly refer to the use of cryoenergy in the production of superconducter and cryoresistance machinery and transformers. Additionally, some groups, which had been working in this field, were working isolated from others, while the decisions making fora were in no hurry to analyze the opportunites for the diversification and amplification of these efforts. Yes, at one point, a very damaging skepticism was expressed.

[Question] If I am not wrong, not long ago you made an initiative, beginning precisely with this situation.

[Answer] Actually, in December 1977, I initiated and organized in Craiova the first National Conference on Superconductibility and Cryoelectrotechnology, a scientific effort designed, first of all, to determine the status of work in this field in our country, secondly, to discuss the controversial problems and, finally, to outline the first national program of cryogenics and cryoelectrotechnology in our country. At that time, I tried to draw attention to certain scientific and technical decisionmaking fora regarding the importance of this problem of great perspective.

[Question] And, did you succeed?

[Answer] In part, yes in part, no. I think that our efforts were too little known. Nonetheless, the National Council of Science and Technology began to be more receptive since, after the conference, together with other colleagues from around the country, we were asked to define the first program organized in Romania at the national level. It is true that it took quite a lot. It would be better to discuss what has been done. We succeeded in bringing together an enthusiastic collective, that includes students, and despite some misunderstandings still held over on the part of those who I would have liked to be alongside us from the beginning and despite some skeptical ideas (generated, actually, by the widespread misunderstanding of the problem), we recently produced the first basic model of a six KVA resistive cryotransformer, followed by a 15 KVA one. Over nearly a two year period, together with other members of the collective, we published a series of articles to popularize cryoelectrotechnology in specialized magazines, with some of them having the purpose to bringing these problems to the attention of specialists. I feel from this point of view we still have much to do.

[Question] ...And, especially from the point of view of practical research and application. At the risk of repeating myself, I must insist upon this point.

[Answer] Undeniably. I think that it must be permanently and consistenly fought until all those who are involved in introducing technical progress in energy will understand that in the next 20 years Romanian energy will not be able to progress without cryogenics. Sometimes I was accused of having an utopian outlook, but I have calmed down. The program-directive referring to the development of energy through the year 2000, a program approved by the 12th Party Congress, calls for precisely the introduction of cryogenic technology in the building of high power electrical machinery and, in general, for energy purposes.

[Question] I understand that this exceptional party document is also a powerful impetus for you in your work.

[Answer] No question, it is a true guide and a stimulus in research work, and more. That which appears in all our party programs stems from real, profound analyses and must be completely realized without any type of refusal. These are, in fact, remarkable tasks for the entire detachment of Romanian researchers and for Romanian science. Our country's energy independence, a main target in the coming years, cannot be conceived without seriously putting to work science and its applications, including cryogenics.

[Question] Comrade professor, do cryoelectrotechnology and cryogenics in general also have in mind the use of new sources of energy?

[Answer] Right now, no. First of all, they make possible the much more efficient use of electrical energy, reducing energy losses and material consumption.

[Question] Then, do not these advantages merit sustained efforts, even if we are currently faced with many difficulties, especially of a technological nature?

[Answer] I am convinced of that, yes! Currently, we are trying to find yet another facet of energy use for superconductibility: the storage of electromagnetic energy in superconductor circuits. It is true that currently the costs for energy stored in such a way, achieved in only two or three countries in the world, are very high: around $32 per KWH (in giant superconductor coils with diameters and lengths in the order of 100 to 300 meters). But, I am convinced that in future years it will come down to 50 cents to $1.00 per KWH.

[Question] In other words, to a price for electrical energy now produced in hydrocentrals. Are you not just a little bit optimistic? Is your outlook too daring?

[Answer] Too daring?! Just at the first glance, especially when it is not understood. Who can stop us from trying to work to resolve it with the appropriate efforts?

[Question] Another question comes up by itself: what must be done now and in the future?

[Answer] This is shown exactly in the program documents of the 12th Romanian Communist Party Congress. First of all, I think that those of us involved in this activity must produce the energy and consistently continue to work despite the still existing difficulties. Secondly, the National Council of Science and Technology is bound, in my opinion, to more quickly provide the appropriate conditions. Moreover, I hope that the national draft research plan will be approved and will begin to take effect in the area of using superconductibility and cryogenics for the period 1980-2000.

[Question] Comrade Silviu Puscasu, beginning just with the facts and from life, I still have not got the drift of it very well, so please repeat: what is, more precisely, the efficiency of the research undertaken by you up until now?

[Answer] The fact that we have built two operating cryotransformer models with very good performance: on the average reducing material consumption by over 50 to 60 percent, which is concrete proof. I am referring to the high power transformers built at Electroputere in Craiova. In the cryoresistance variation (cooled with liquid nitrogen) or the superconductor variation (cooled with liquid helium), the savings in raw materials can be counted, piece by piece, in the order of tons. Thus, the specific weight is reduced. Already a part of them, like the ones named above, has been made and tested. If, today, Electroputere is building 400MVA transformers with a certain level of material consumption, not many years will go by before the same factory will be building transformers with five times the power, using the same amount of materials. In the case of the Bucharest Enterprise for Electrotechnical Machinery, I am sure it will produce during this same period cryo-turbogenerators using superconductor excitation built with the same amount of materials as is used in the classical 330 MW type, but with six times the power.

[Question] I wish you great success and I thank you.

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